

FIG. 1B.

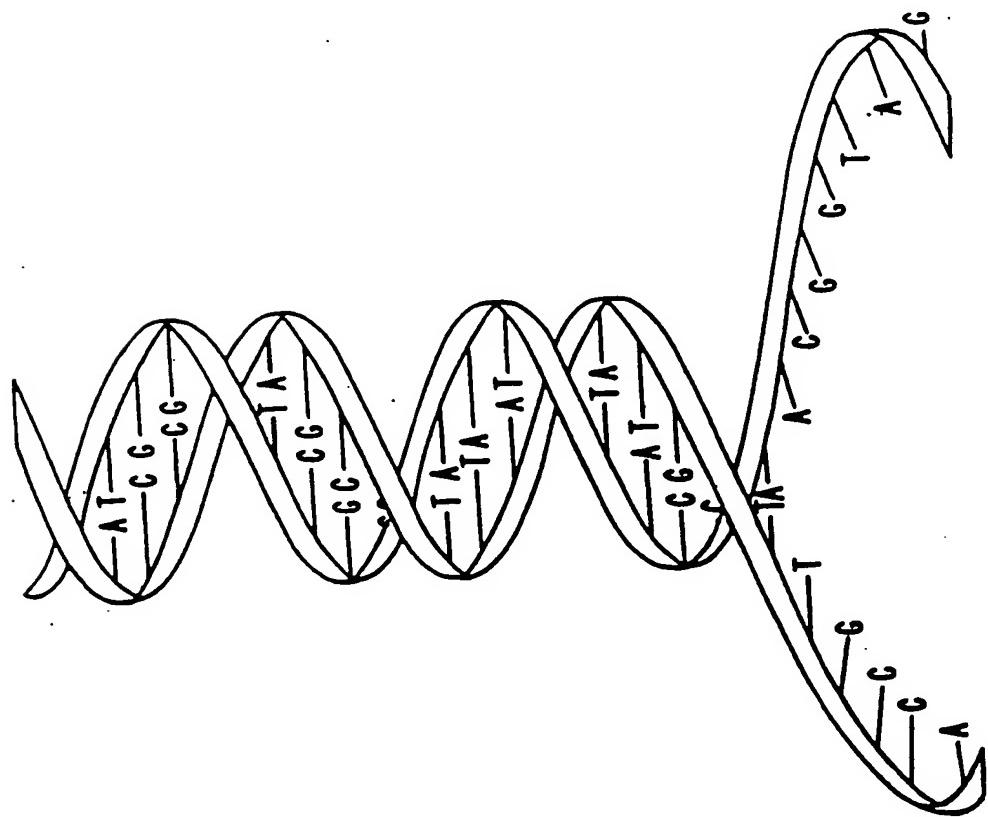
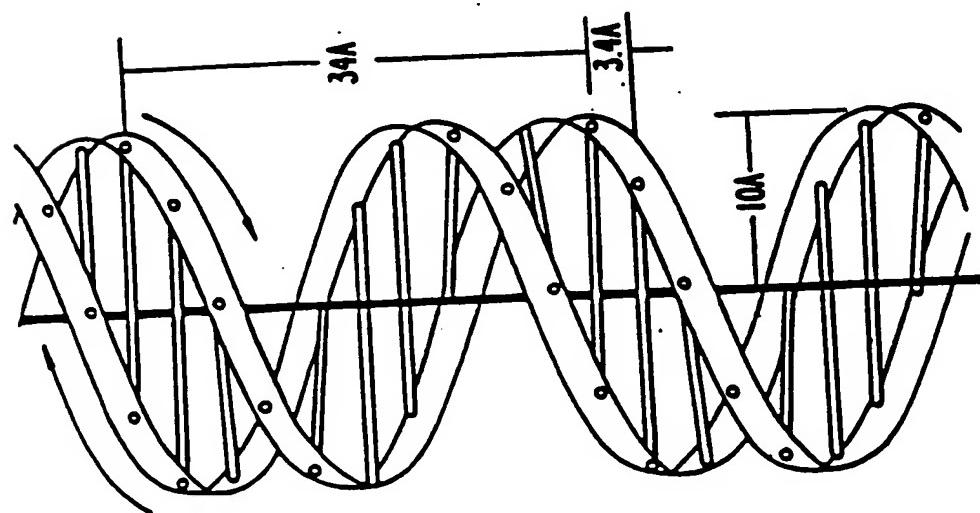


FIG. 1A.



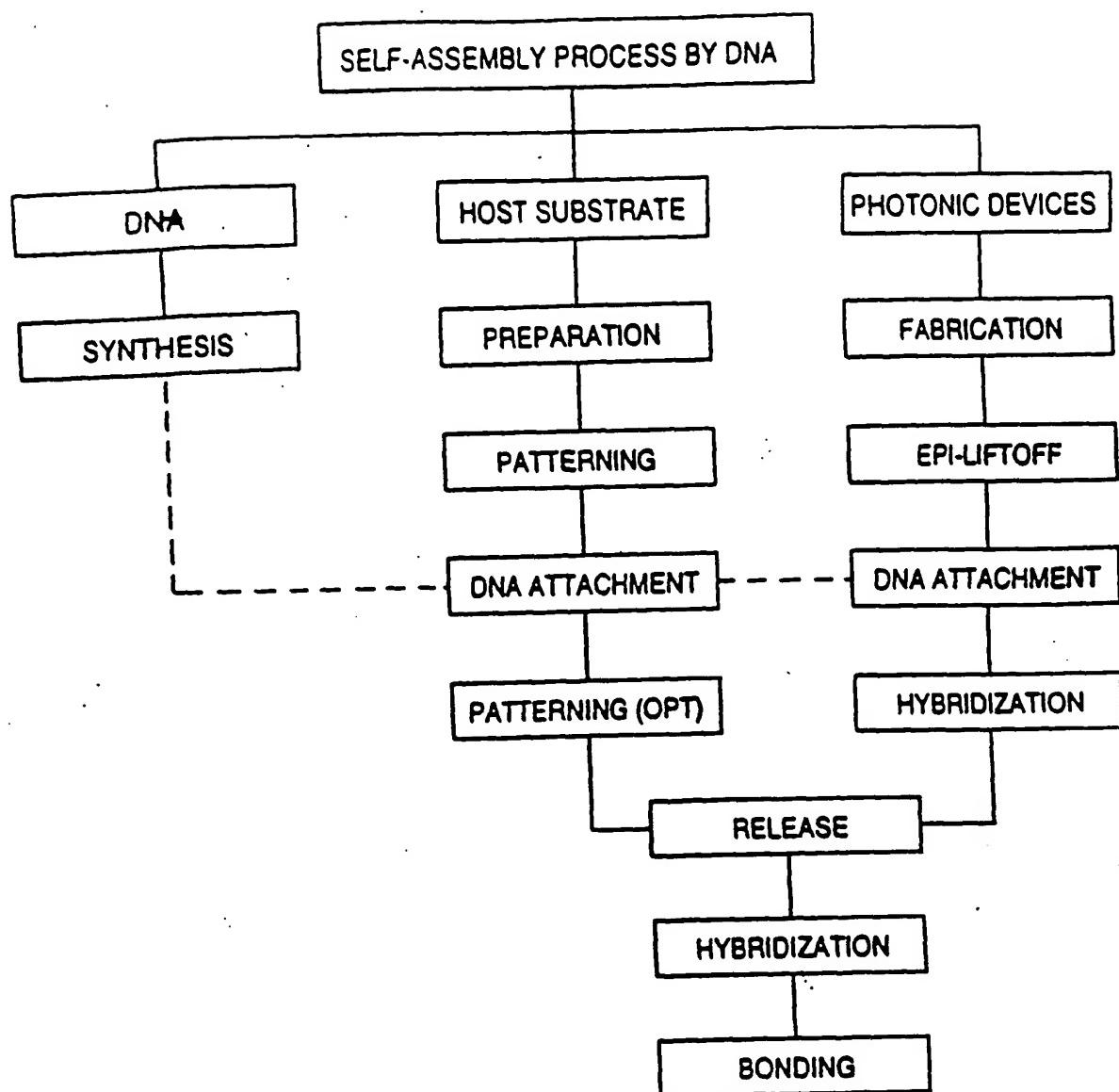


FIG. 2.

FIG. 3B.

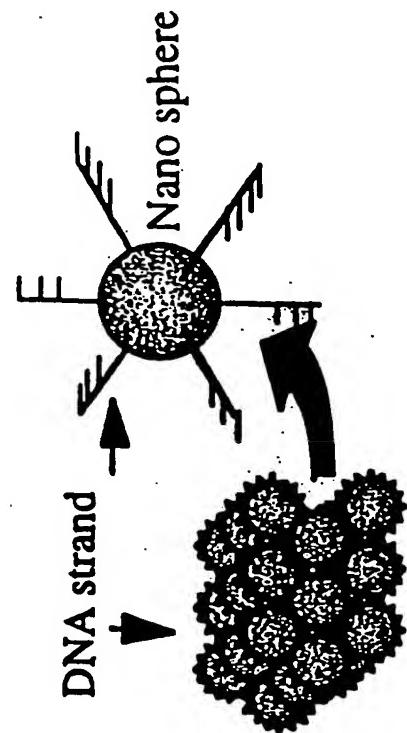
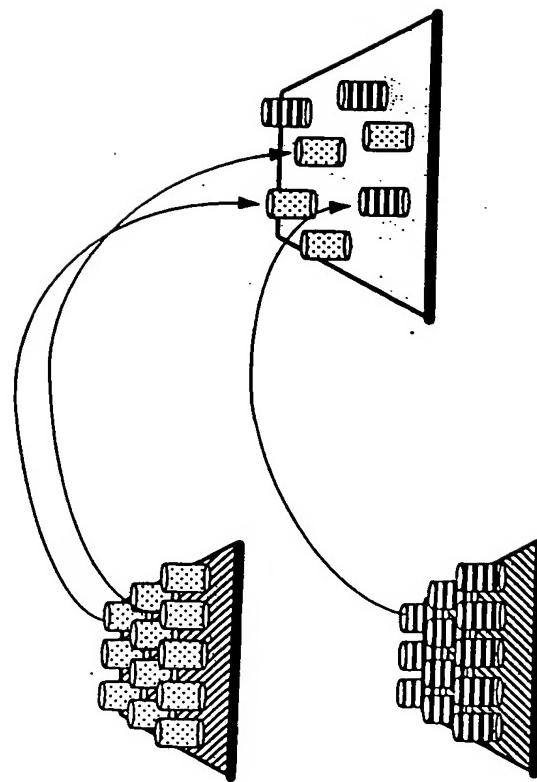


FIG. 3A.



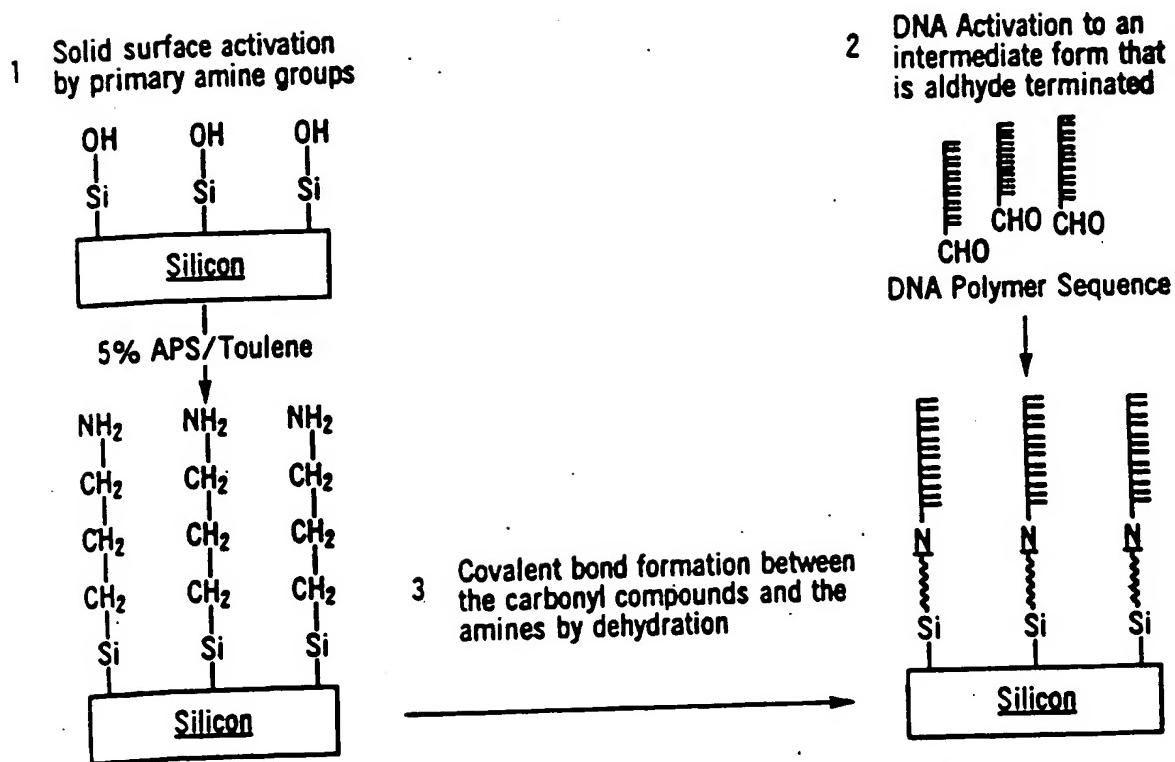


FIG. 4.

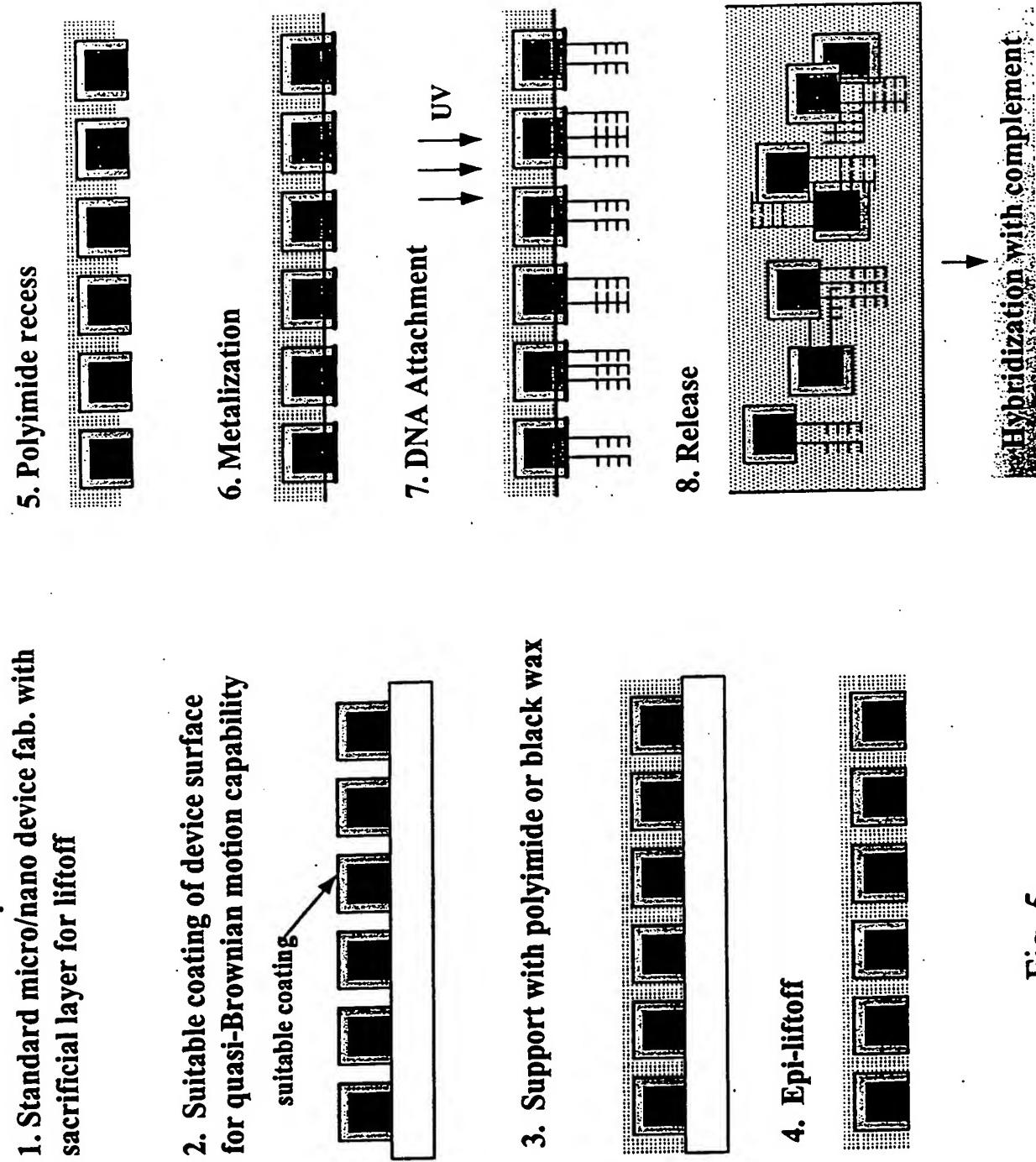


Fig. 5

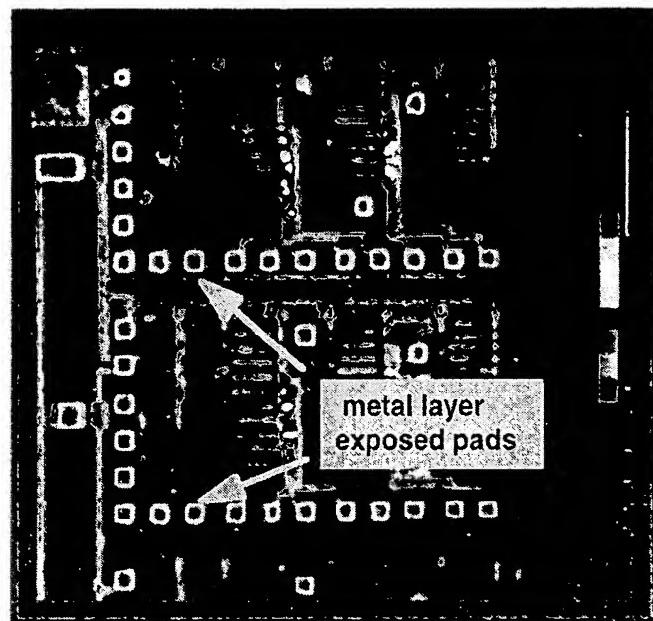
AFFINITY BASED SELF-ASSEMBLY SYSTEMS AND DEVICES FOR  
PHOTONIC AND ELECTRONIC APPLICATIONS

Inventors: Heller et al.

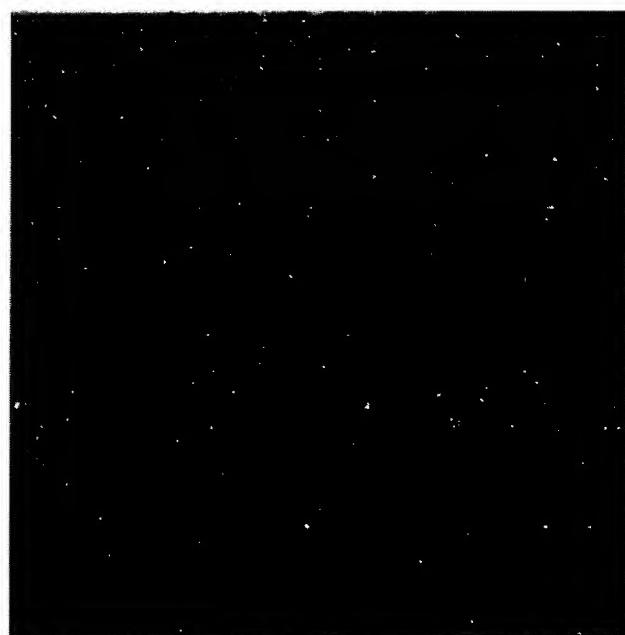
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*Fig. 6*



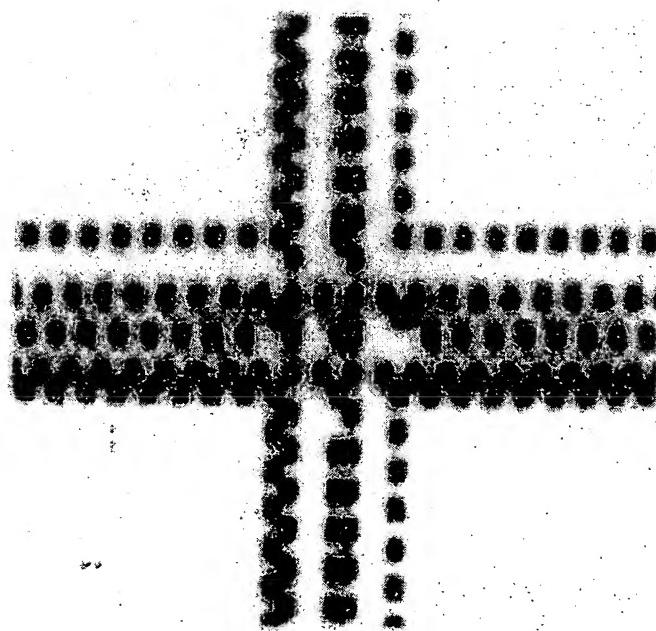
*Fig. 7*

AFFINITY BASED SELF-ASSEMBLY SYSTEMS AND DEVICES FOR  
PHOTONIC AND ELECTRONIC APPLICATIONS

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*Fig. 8A*



*Fig. 8B*

FIG. 9

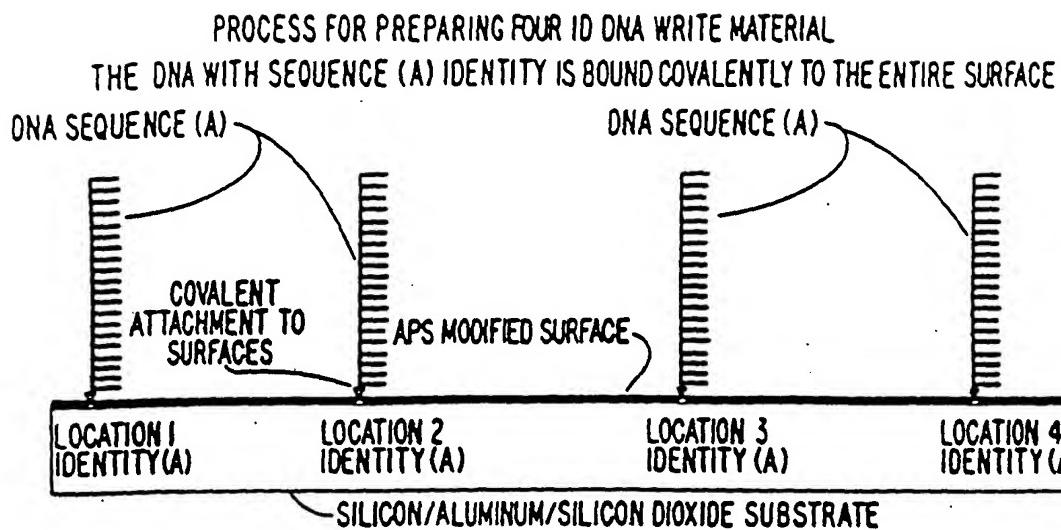


FIG. 10

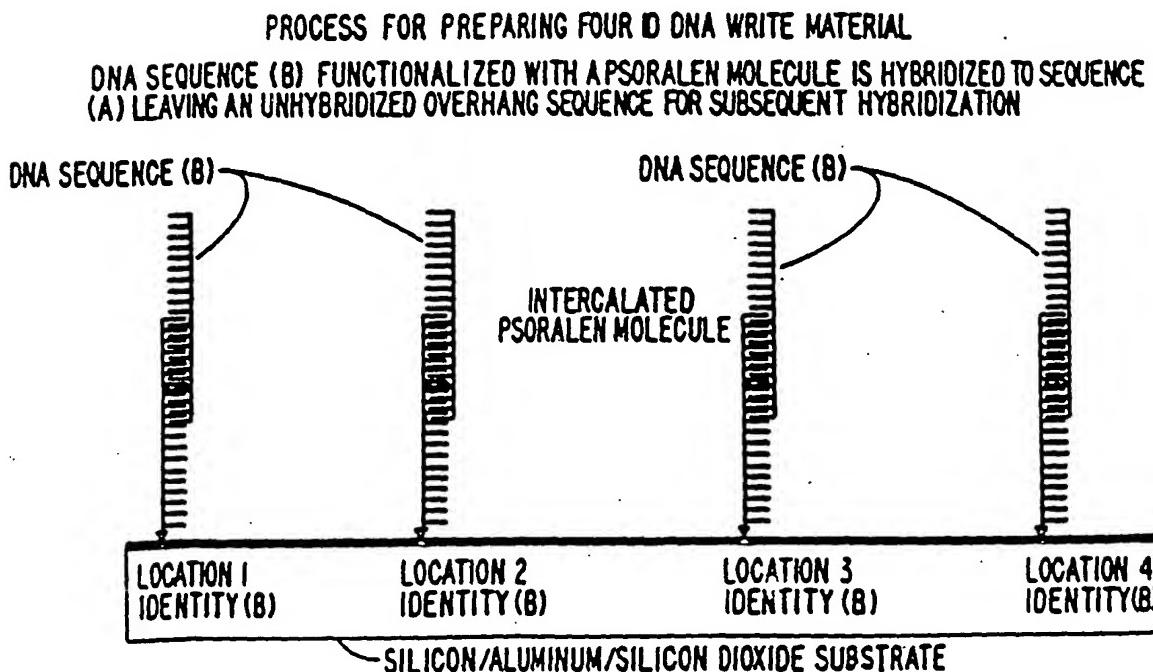


FIG. 11

LOCATION #1 IS MASKED FROM UV EXPOSURE WHILE LOCATIONS 2,3 & 4 ARE EXPOSED ALLOWING THE PSORALEN MOLECULES TO COVALENTLY CROSS-LINK THE (A) AND (B) DNA SEQUENCE.

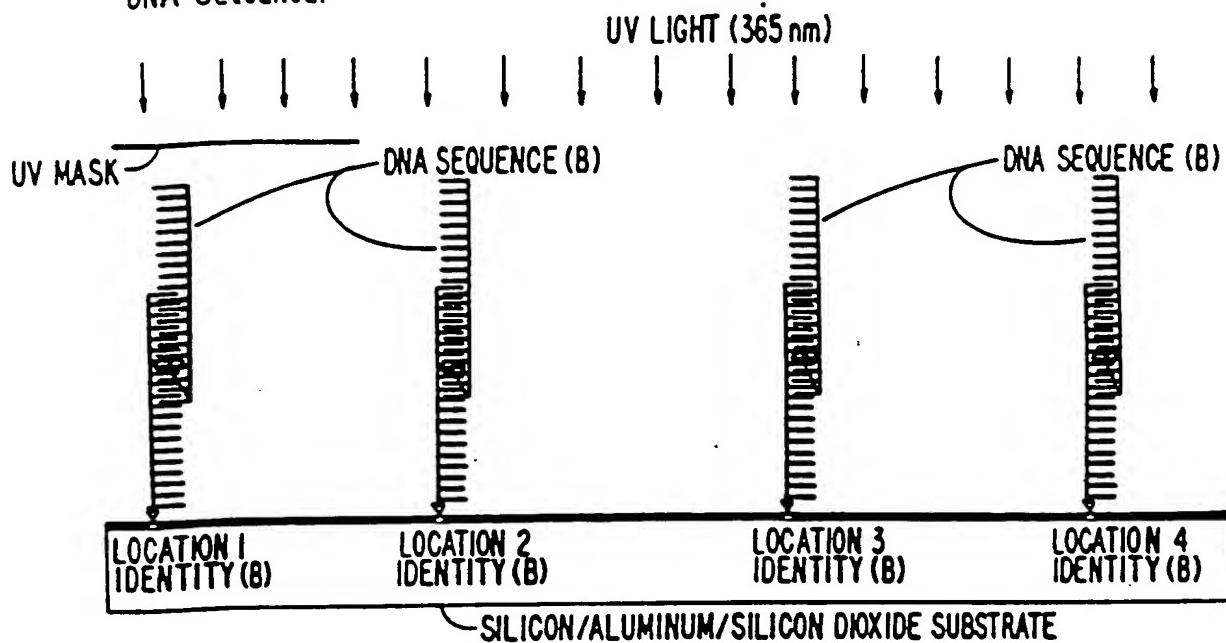
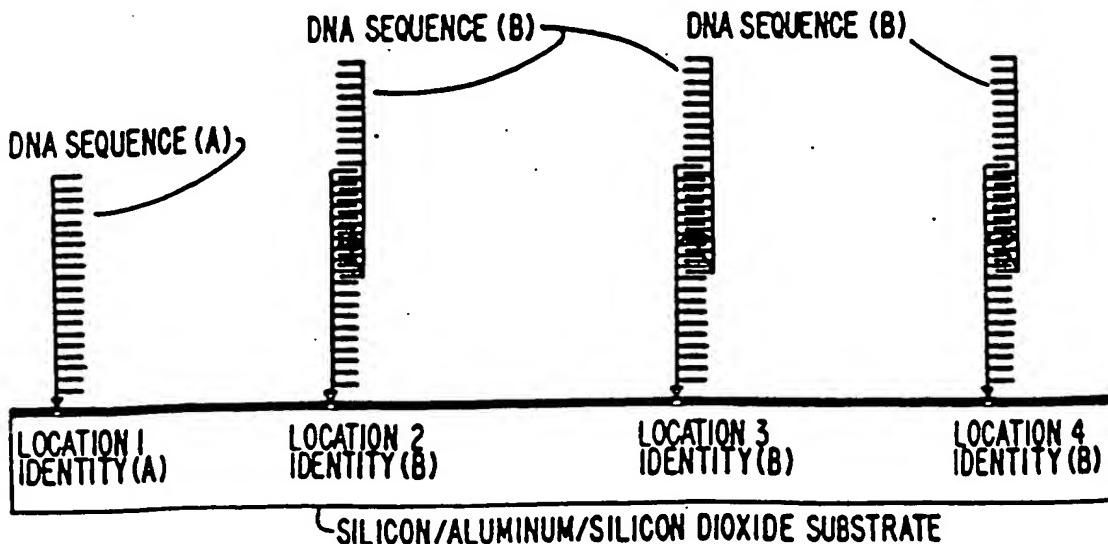


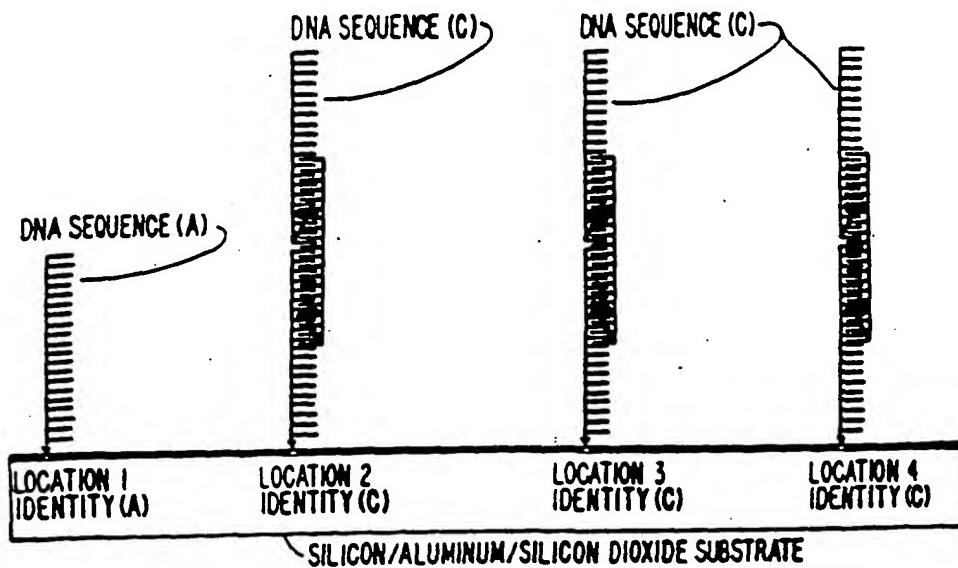
FIG. 12

PROCESS FOR PREPARING FOUR ID DNA WRITE MATERIAL

DEHYBRIDIZATION IS CARRIED OUT TO REMOVE THE NON-CROSSLINKED SEQUENCE (B) FROM THE 1st LOCATION, WHICH NOW HAS A PERMANENT (A) SEQUENCE IDENTITY. DNA SEQUENCE (B) IS NOW COVALENTLY COUPLED TO LOCATIONS 2, 3 AND 4



**FIG. 13.**  
PROCESS FOR PREPARING FOUR ID DNA WRITE MATERIAL  
A PSORALEN FUNCTIONALIZED DNA SEQUENCE (C) IS NOW HYBRIDIZED TO SEQUENCE (B),  
AND THE PROCESS IS REPEATED.



**FIG. 14.**  
PROCESS FOR PREPARING FOUR ID DNA WRITE MATERIAL  
LOCATIONS 1 AND 2 ARE NOW MASKED WHILE LOCATIONS 3 AND 4 ARE EXPOSED AFFECTING  
THE COVALENT CROSS-LINKING OF SEQUENCES (B) AND (C).

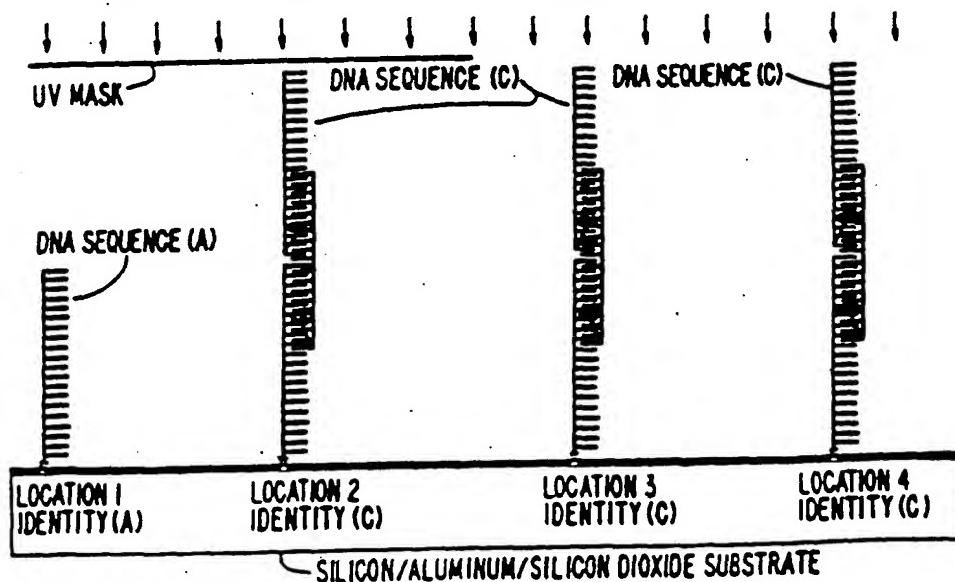


FIG. 15

PROCESS FOR PREPARING FOUR ID DNA WRITE MATERIAL

DEHYBRIDIZATION IS CARRIED OUT TO REMOVE SEQUENCE (C) FROM LOCATION 2.  
A PERMANENT (B) DNA SEQUENCE IS NOW PRESENT AT LOCATION 2

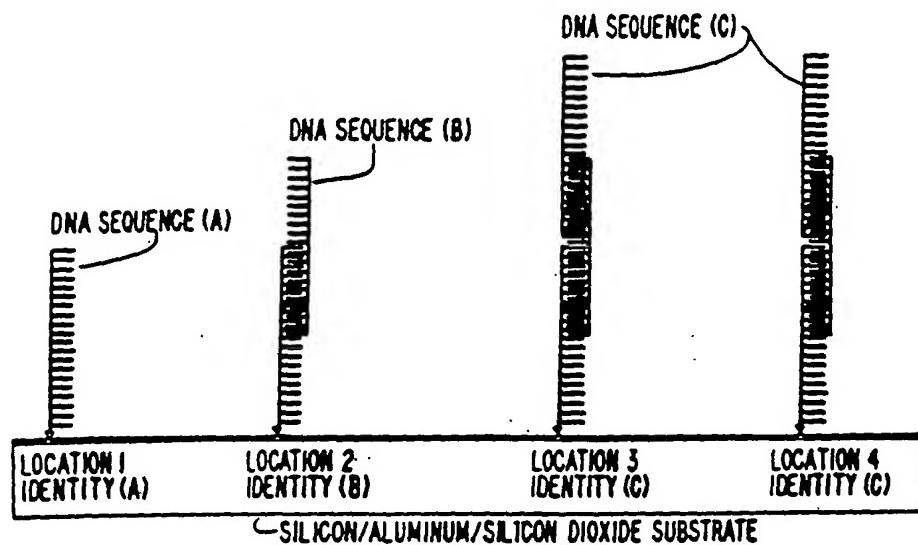


FIG. 16

PROCESS FOR PREPARING FOUR ID DNA WRITE MATERIAL

A PSORALEN FUNCTIONALIZED DNA SEQUENCE (D)  
IS NOW HYBRIDIZED TO SEQUENCE (C), AND THE  
PROCESS IS REPEATED.

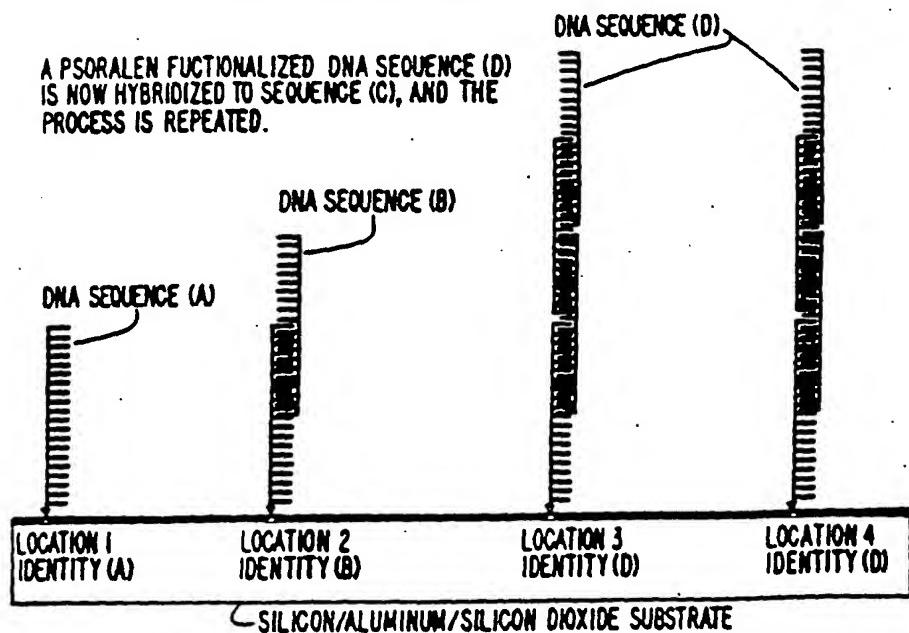


FIG. 17

PROCESS FOR PREPARING FOUR ID DNA WRITE MATERIAL

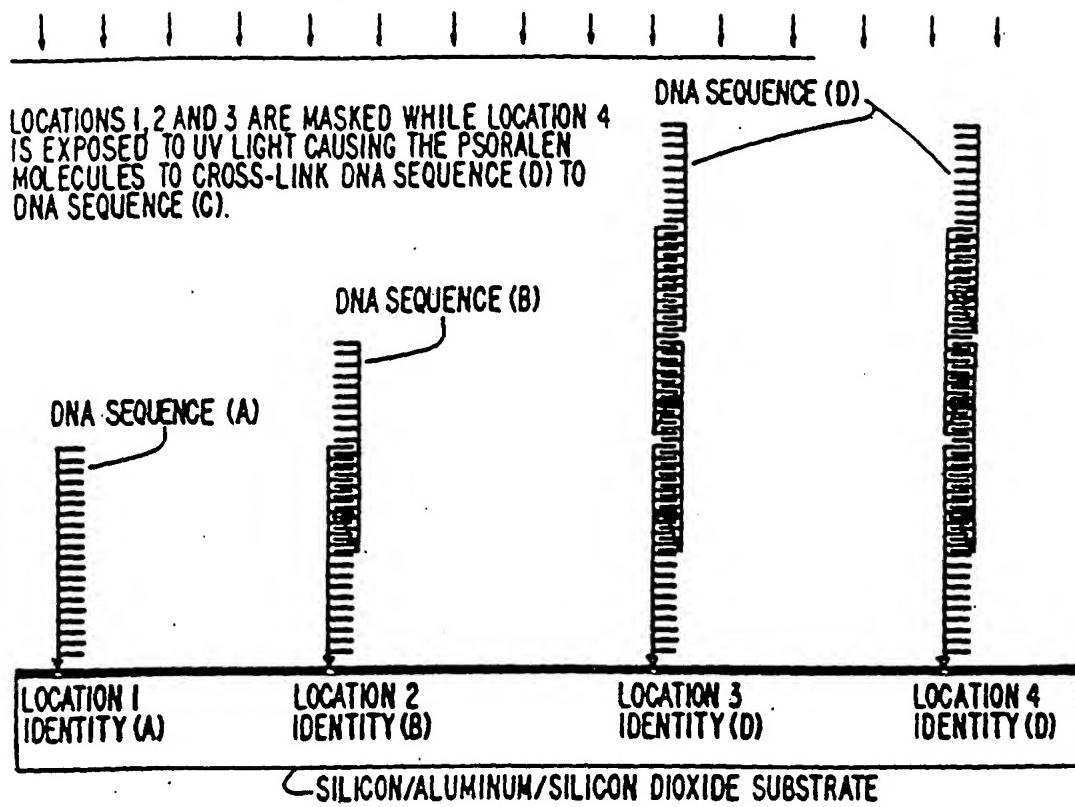
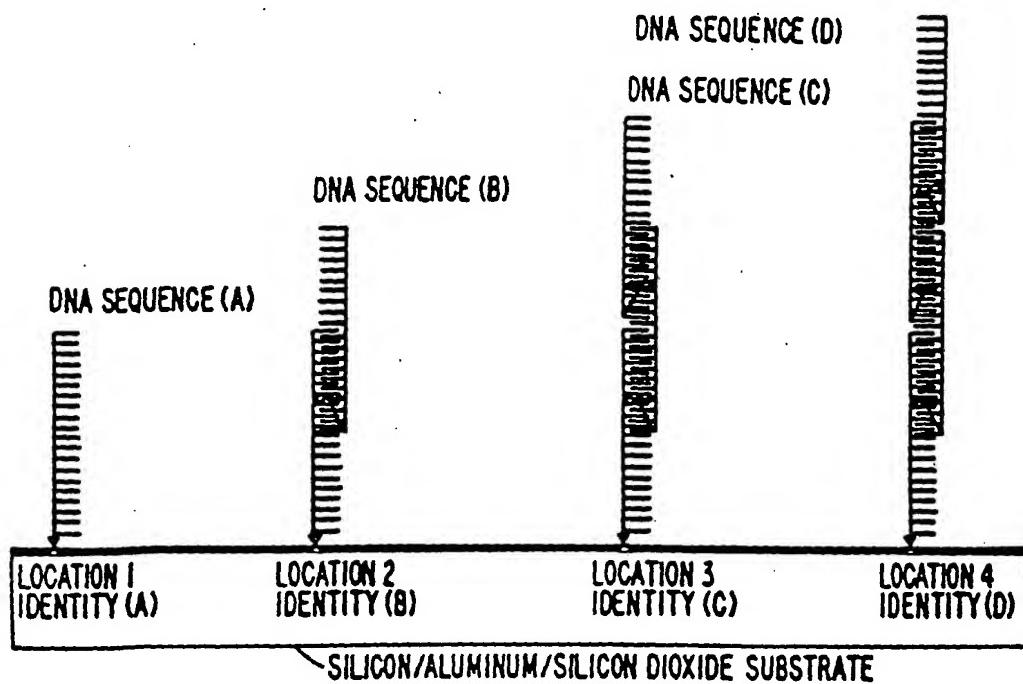


FIG. 18

PROCESS FOR PREPARING FOUR ID DNA WRITE MATERIAL

DEHYBRIDIZATION IS CARRIED OUT TO REMOVE DNA SEQUENCE (D) FROM LOCATION 3. A PERMANENT (C) IDENTITY IS PRESENT AT LOCATION 3 AND A PERMANENT (D) IDENTITY IS PRESENT AT LOCATION 4. THIS COMPLETES THE PROCESS FOR PREPARING A FOUR ID DNA WRITE MATERIAL.



AFFINITY BASED SELF-ASSEMBLY SYSTEMS AND DEVICES FOR  
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FIG. 19  
PROCESS FOR PREPARING FOUR ID DNA WRITE MATERIAL

COMPLEMENTARY DNA SEQUENCES TO (A), (B), (C), (D)  
IDENTITIES LABELED WITH FOUR RESPECTIVE FLUORESCENT  
DYES CAN BE HYBRIDIZED TO DEMONSTRATE EACH IDENTITY

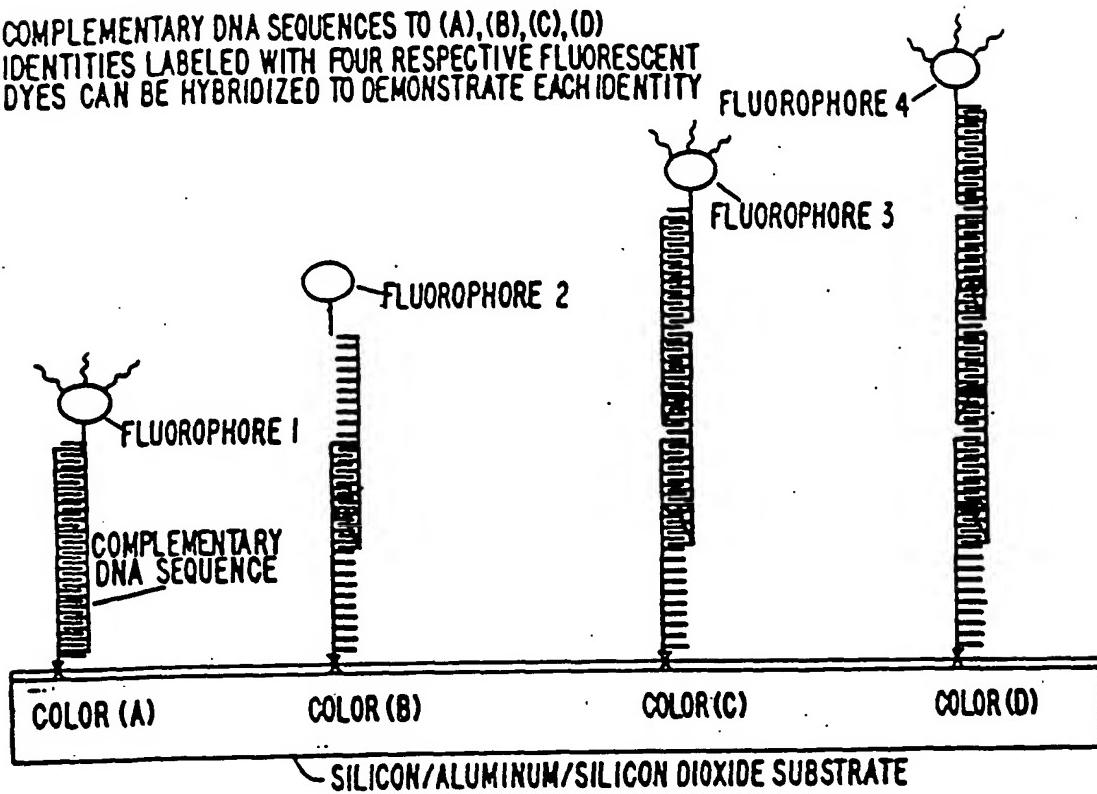


FIG. 20

PROCESS FOR WRITING TO FOUR ID DNA WRITE MATERIAL

↓ ↓ ↓ ↓ | | | | | | | | | | | |  
HIGH ENERGY UV LIGHT (254 nm)

THIS DIAGRAM SHOWS THE CHIP SURFACE WITH (A),(B),  
(C) AND (D) IDENTITIES. BY EXPOSING LOCATIONS 1 AND  
3 TO HIGH ENERGY UV LIGHT AND MASKING LOCATIONS 2  
AND 4, 1 AND 3 ARE RENDERED UNHYBRIDIZABLE WHILE  
2 AND 4 RETAIN THE ABILITY TO HYBRIDIZE

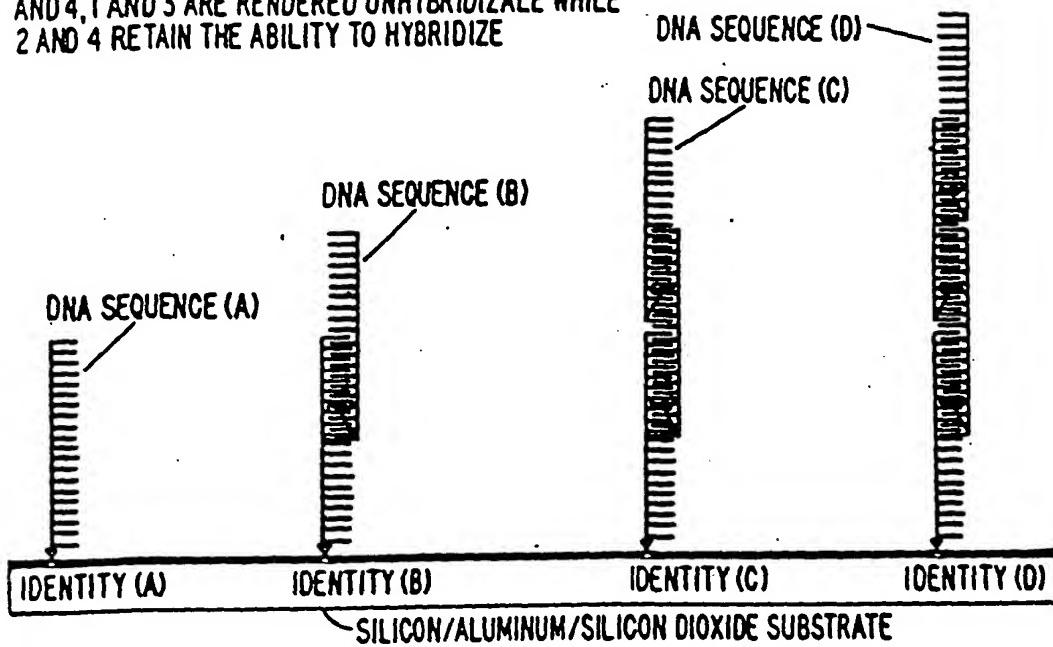


FIG. 21

PROCESS FOR WRITING TO FOUR ID DNA WRITE MATERIAL

SELECTIVE UV EXPOSURE LEAVES LOCATIONS 1 AND 3 UNHYBRIDIZABLE  
AND LOCATIONS 2 AND 4 RETAIN THE ABILITY TO HYBRIDIZE

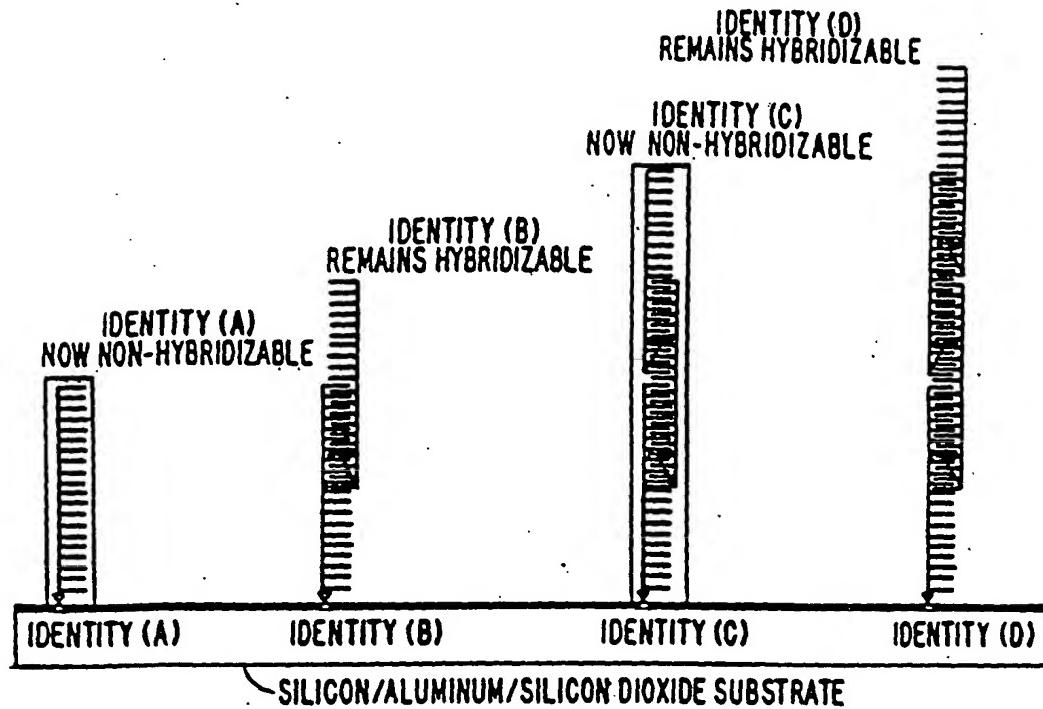
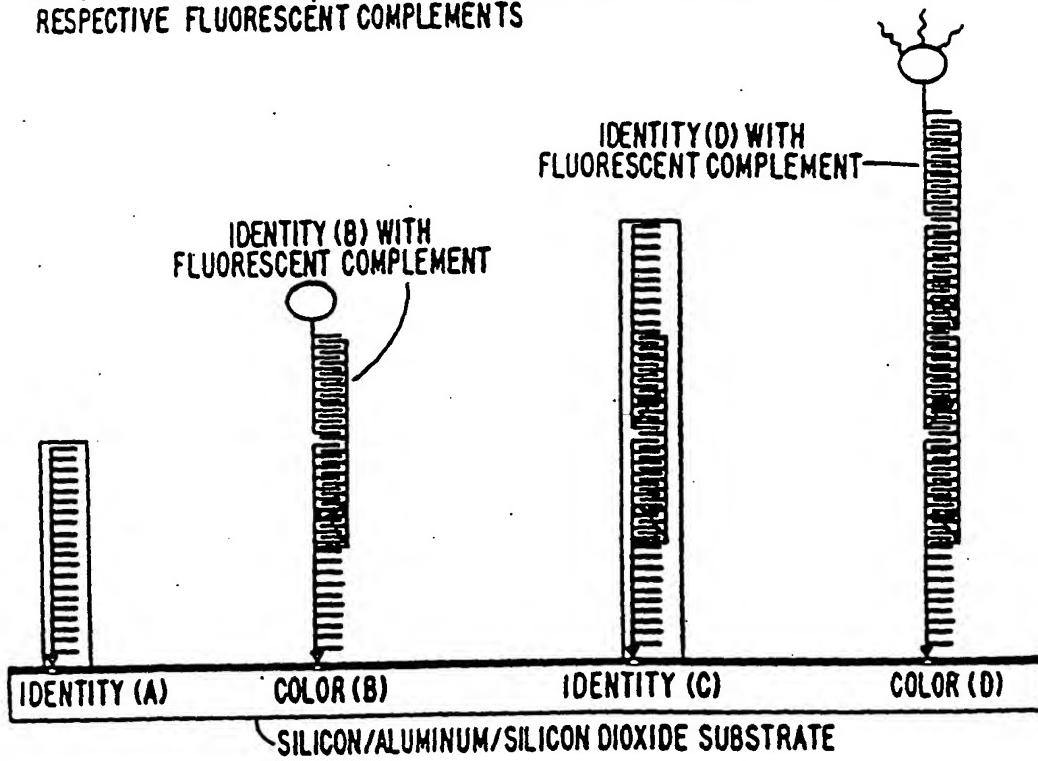


FIG. 22.

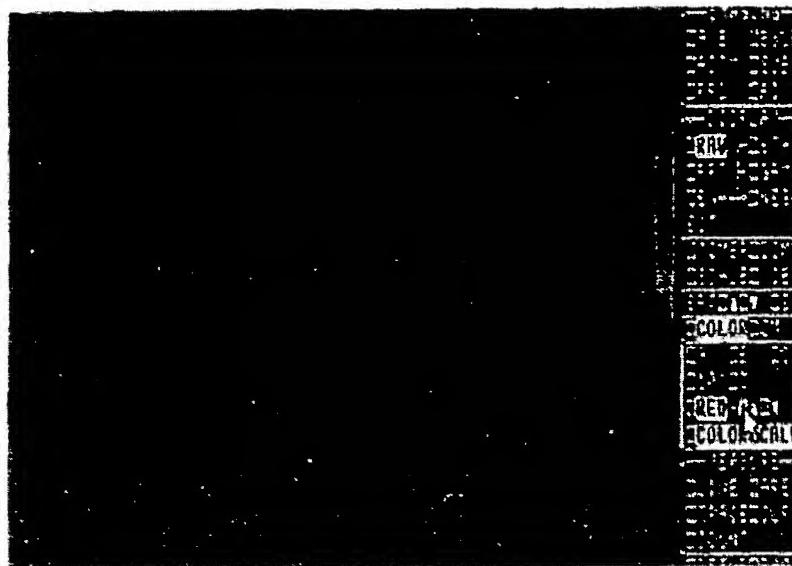
PROCESS FOR WRITING TO FOUR ID DNA WRITE MATERIAL

ALL 4 DNA COMPLEMENTS LABELED WITH THEIR RESPECTIVE FLUORPHORES ARE  
APPLIED TO THE SURFACE, ONLY LOCATIONS (B) AND (D) HYBRIDIZE THEIR  
RESPECTIVE FLUORESCENT COMPLEMENTS

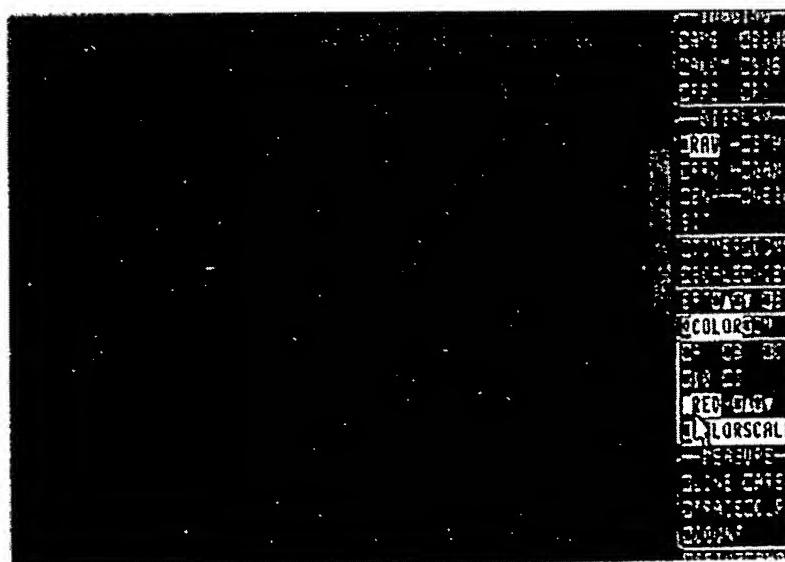


# AFFINITY BASED SELF-ASSEMBLY SYSTEMS AND DEVICES FOR PHOTONIC AND ELECTRONIC APPLICATIONS

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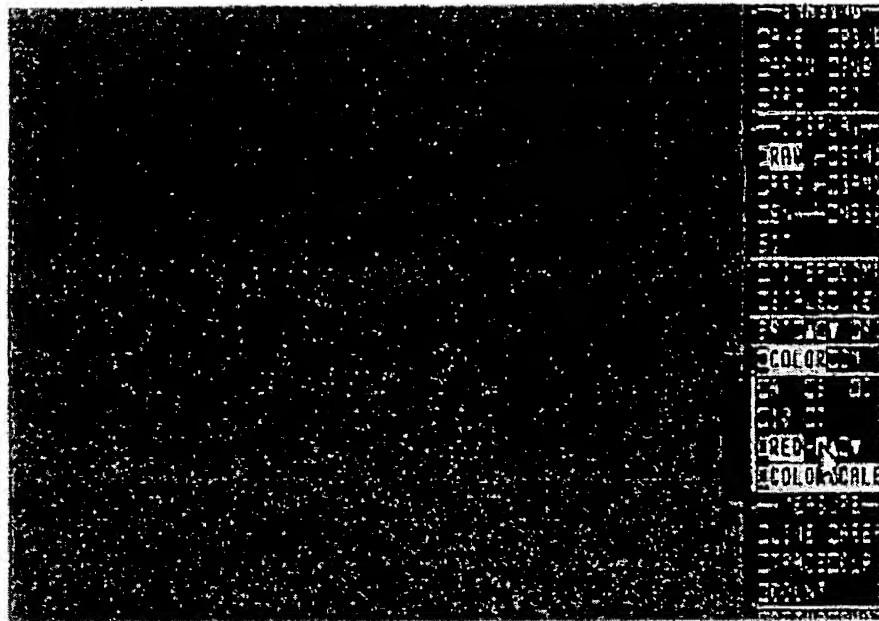
*Fig. 23A*



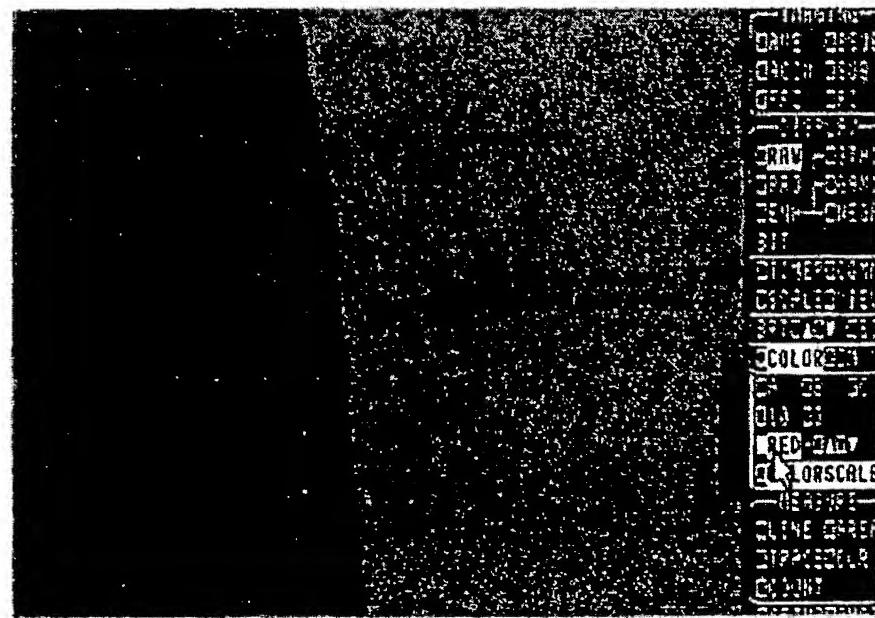
*Fig. 23B*

# AFFINITY BASED SELF-ASSEMBLY SYSTEMS AND DEVICES FOR PHOTONIC AND ELECTRONIC APPLICATIONS

INVENTOR'S NAME  
Inventors: Heller et al.  
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*Fig. 24A*



*Fig. 24B*

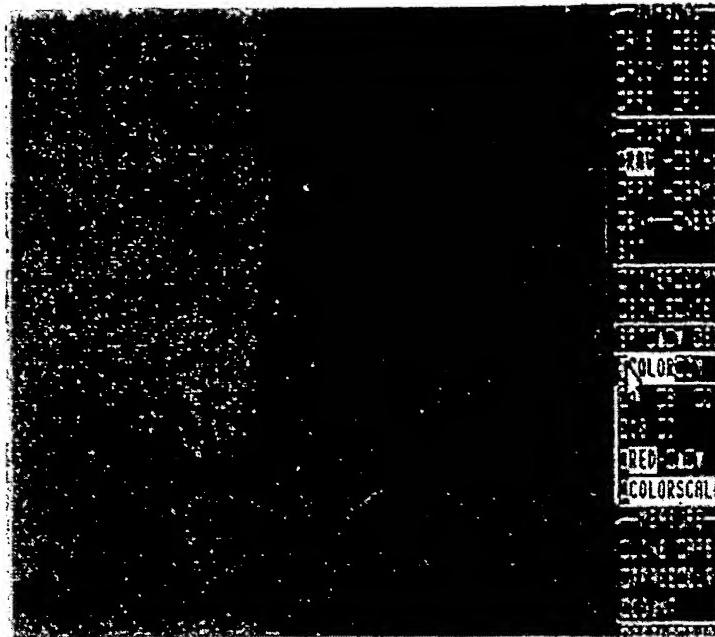
# AFFINITY BASED SELF-ASSEMBLY SYSTEMS AND DEVICES FOR PHOTONIC AND ELECTRONIC APPLICATIONS

Inventors: Heller et al.

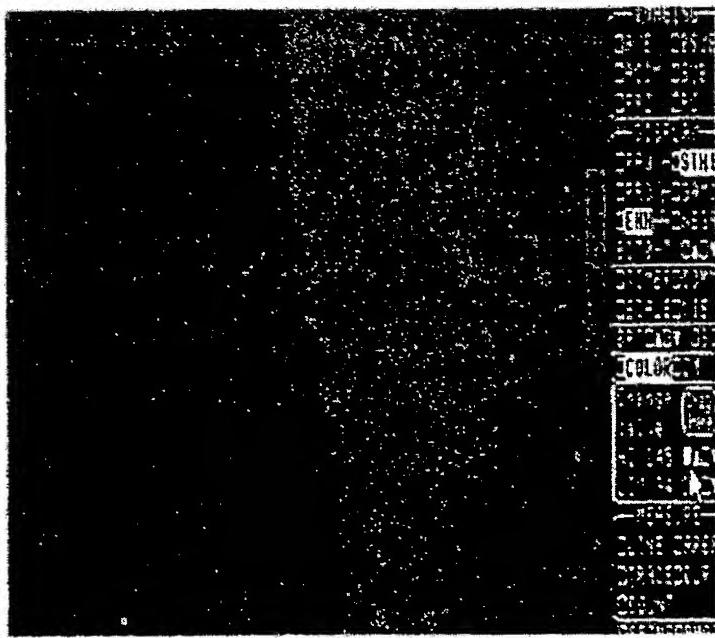
Docket No. 612,404-424

Express Mail No. EV337191037US

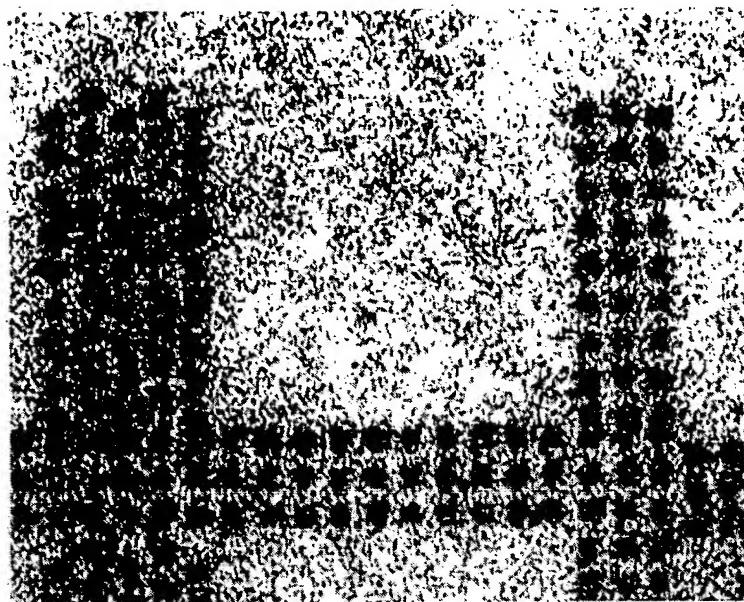
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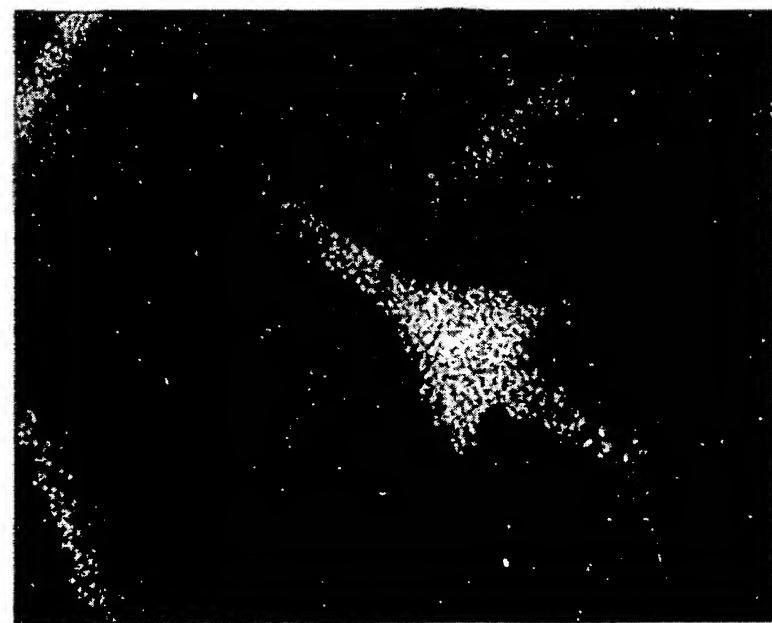
*Fig. 25A*



*Fig. 25B*



*Fig. 26A*



*Fig. 26B*

FIG. 27A

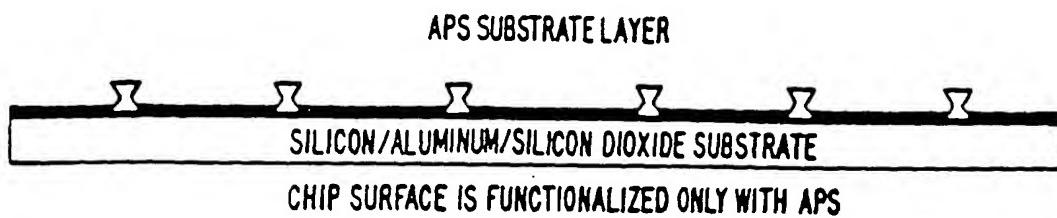
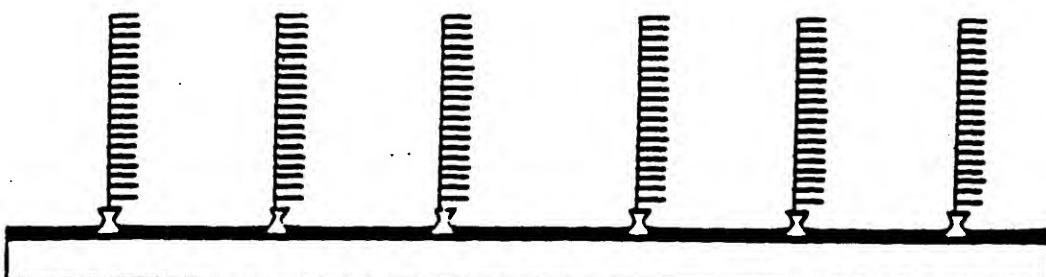
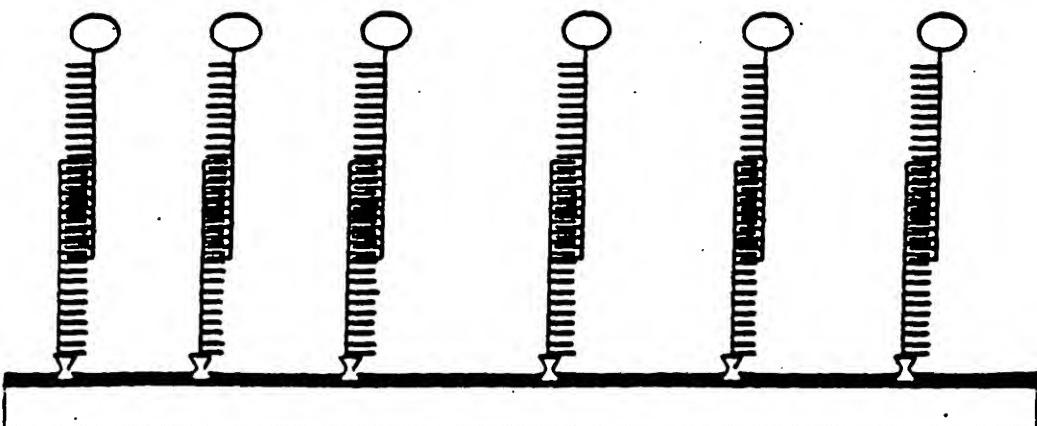


FIG. 27B



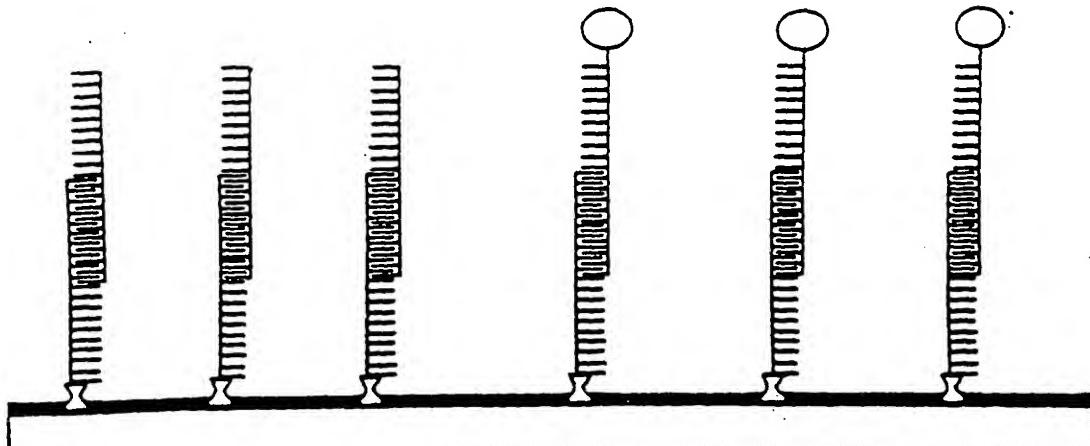
ORIGINAL CAPTURE DNA SEQUENCE A, WHICH IS NOT FLUORESCENTLY LABELED, IS COVALENTLY ATTACHED TO THE APS LAYER ON THE CHIP SURFACE

FIG. 27C



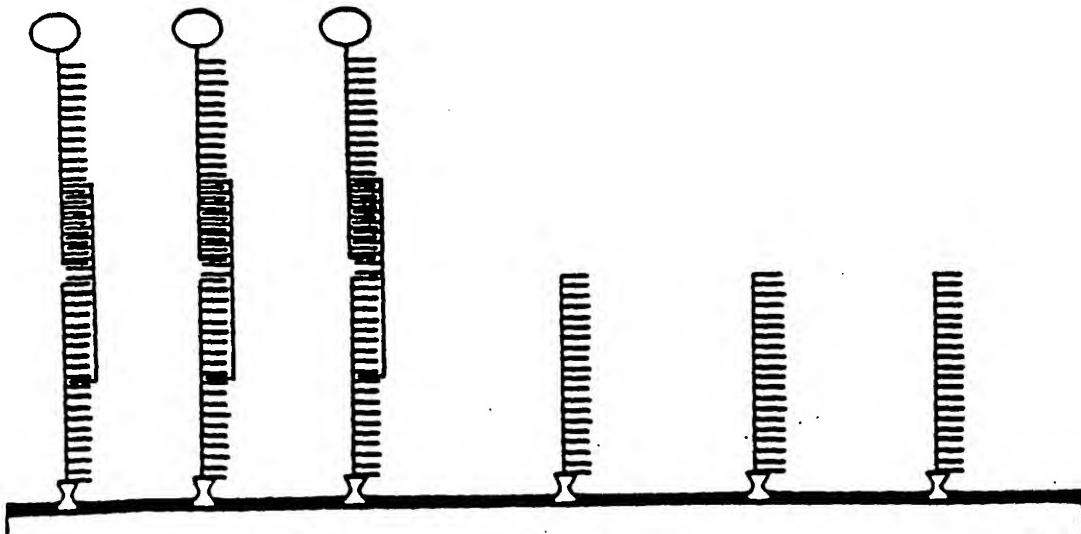
FLUORESCENTLY LABELED COMPLEMENTARY DNA SEQUENCE TO THE (A) IDENTITY ON THE SURFACE IS HYBRIDIZED TO THE ENTIRE CHIP LEAVING THE ENTIRE SURFACE BRIGHT

FIG. 28A



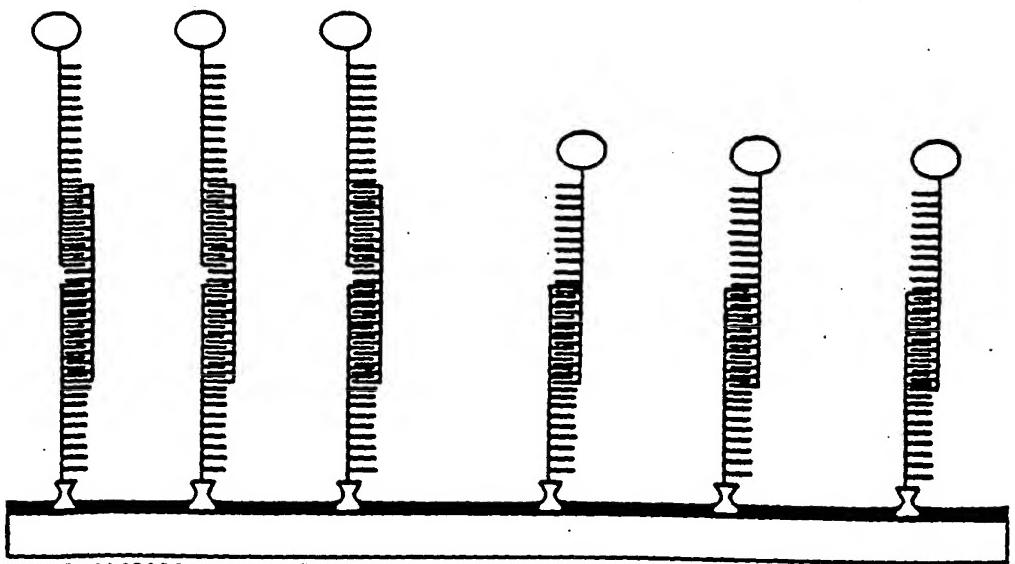
1/2 OF SURFACE IS UV CROSSLINKED SO WHEN THE BODIPY TEXAS RED LABELED (A) IDENTITY COMPLEMENT IS HYBRIDIZED ACROSS THE ENTIRE CHIP ONLY THE NON-CROSSLINKED RIGHT SIDE OF THE CHIP ATTAINS COLOR

FIG. 28B



AFTER UV CROSSLINKING THE BODIPY ORANGE LABELED (B) DNA COMPLEMENT IS HYBRIDIZED LEAVING ONLY THE (B) IDENTITY LEFT SIDE OF THE CHIP BRIGHT

FIG. 28C



AFTER UV CROSSLINKING BOTH (A) AND (B) DNA COMPLEMENTS LABELED WITH THEIR RESPECTIVE FLUOROPHORES ARE HYBRIDIZED TO THE SURFACE, THE LEFT SIDE ATTAINING THE BOOIPY ORANGE AND THE RIGHT ATTAINING THE BOOIPY TEXAS RED COLOR

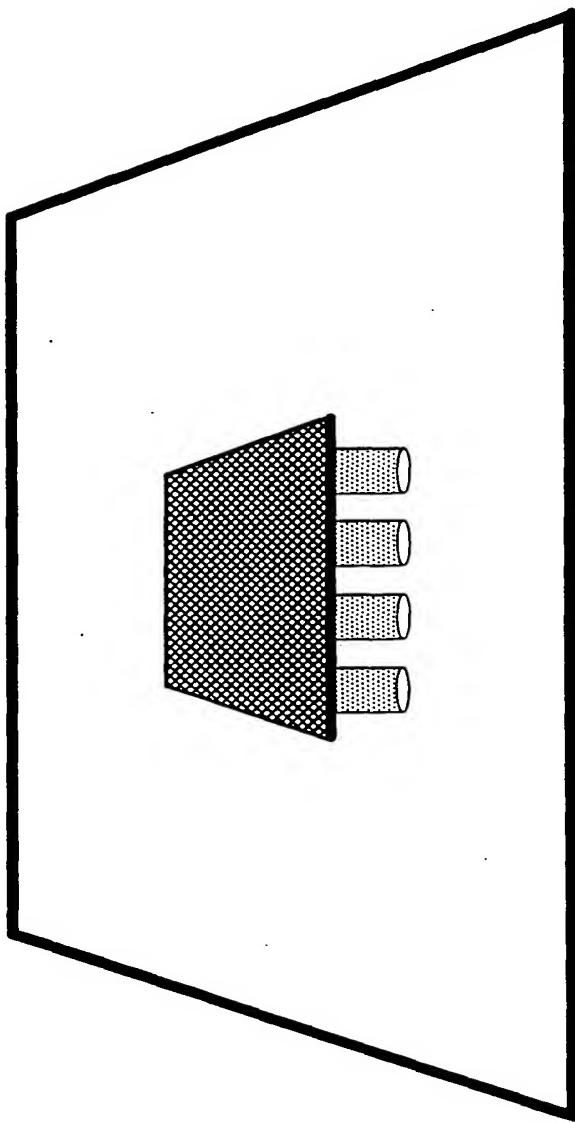
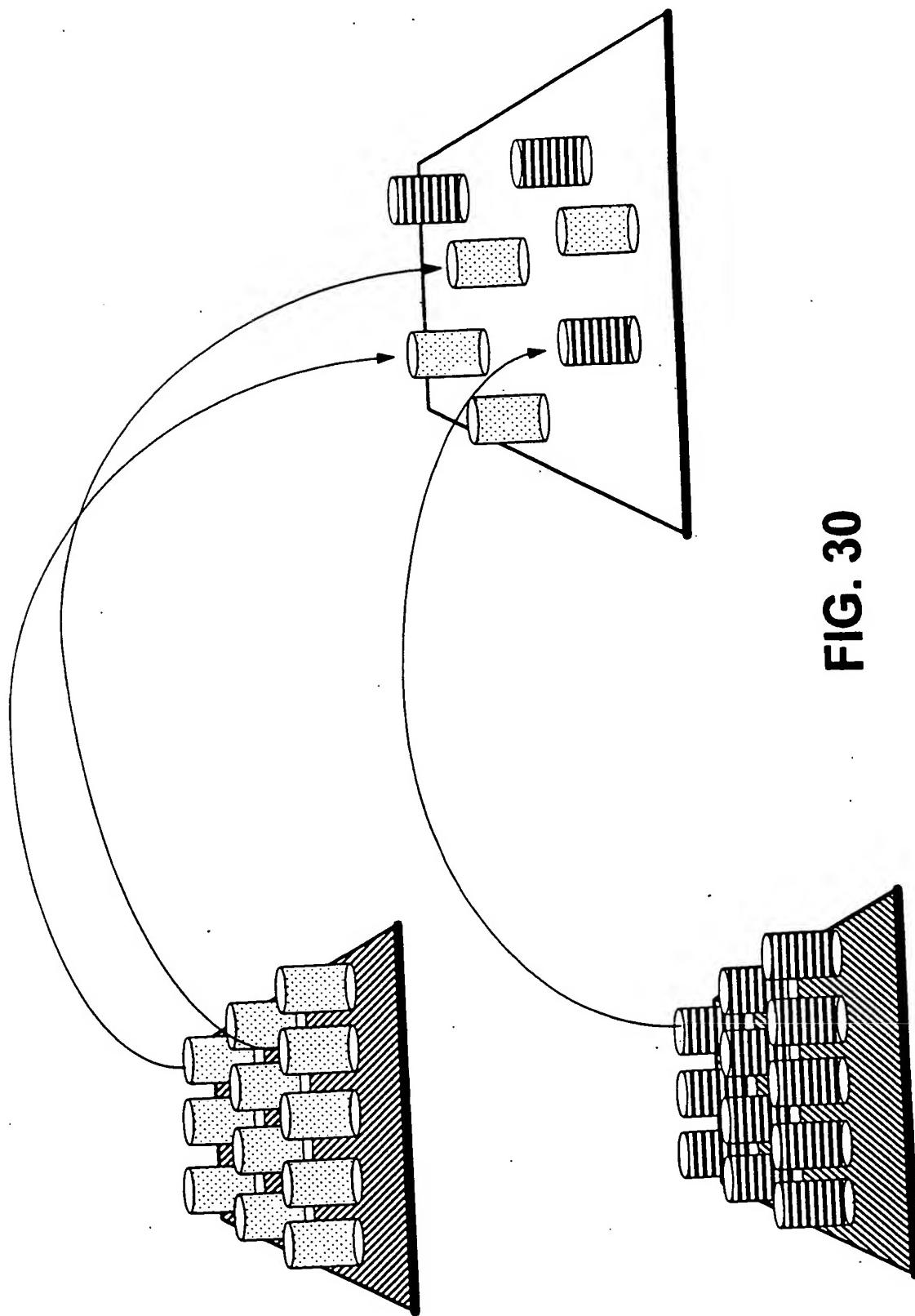


FIG. 29



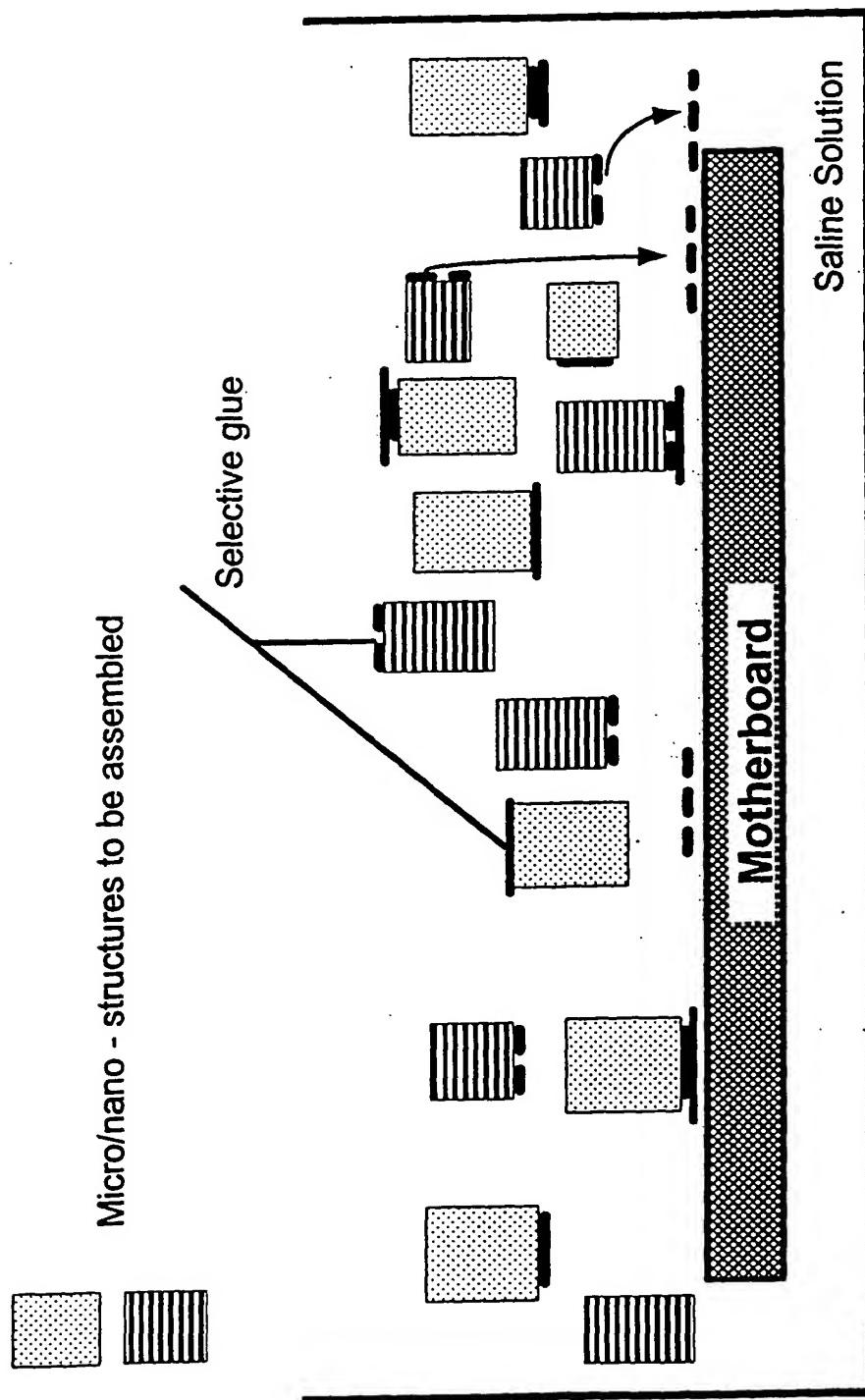


FIG. 31

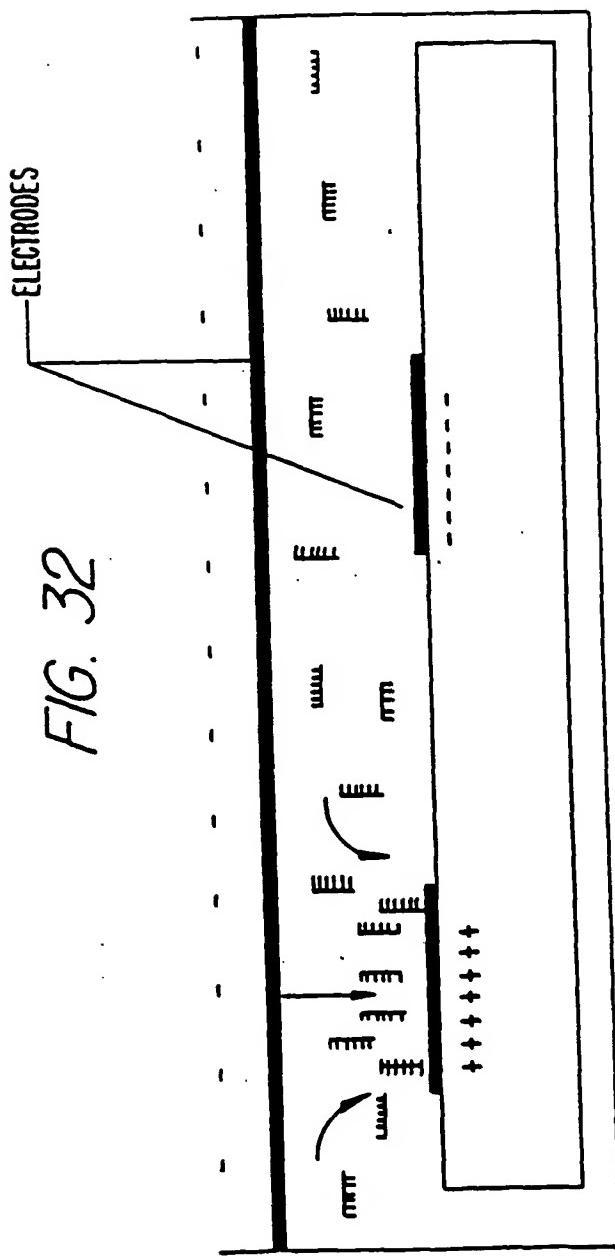


FIG. 33

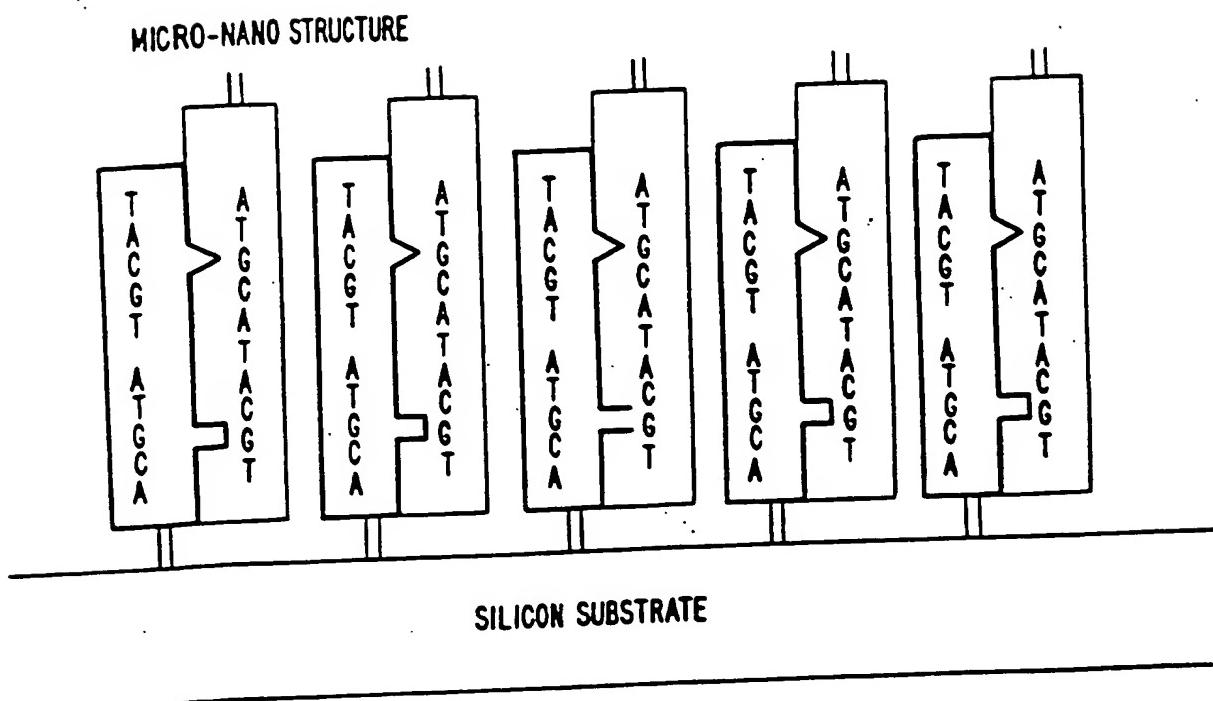


FIG. 34

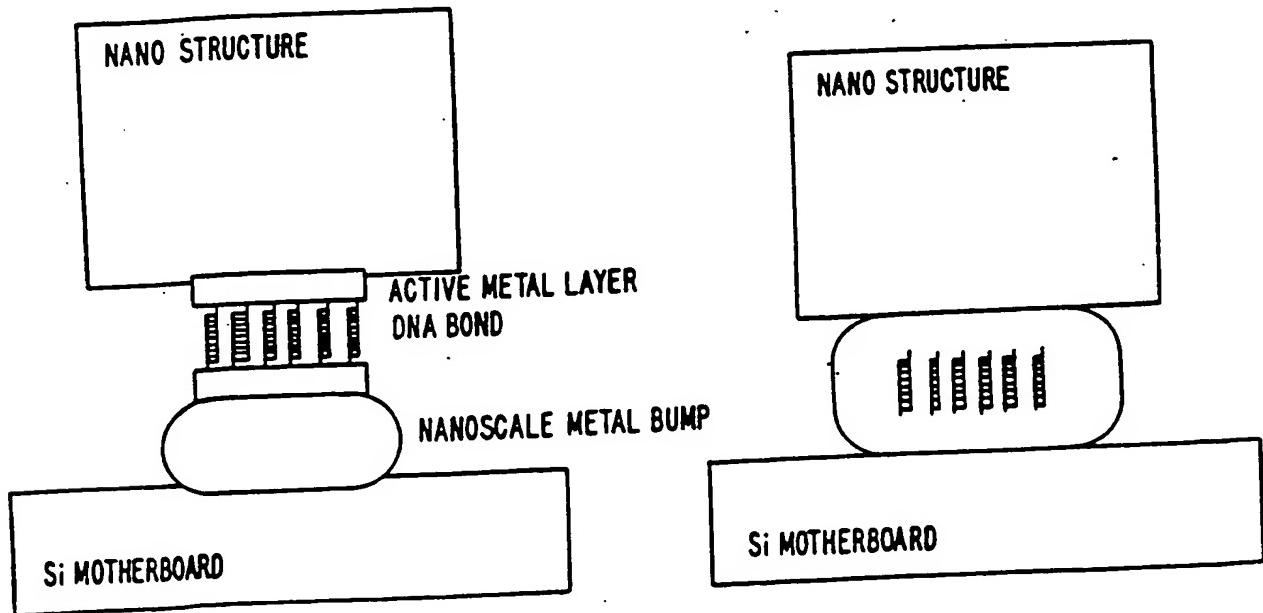
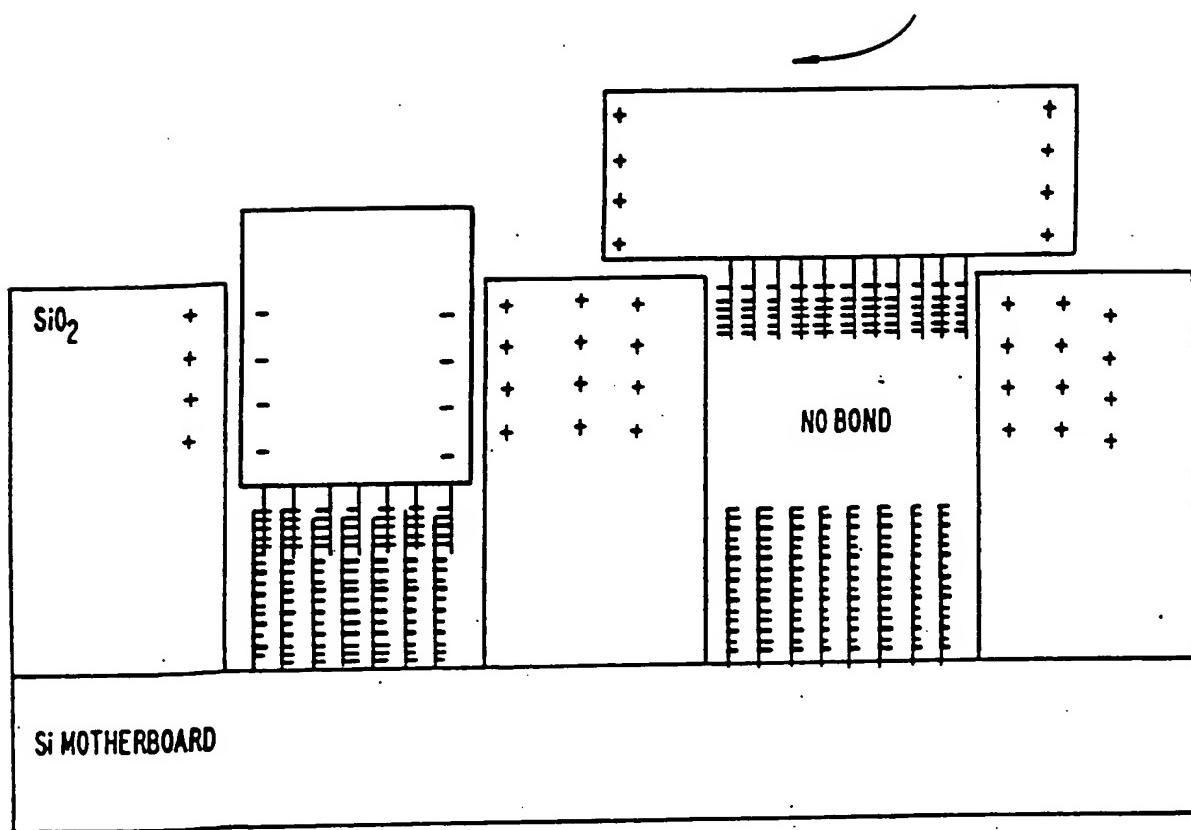
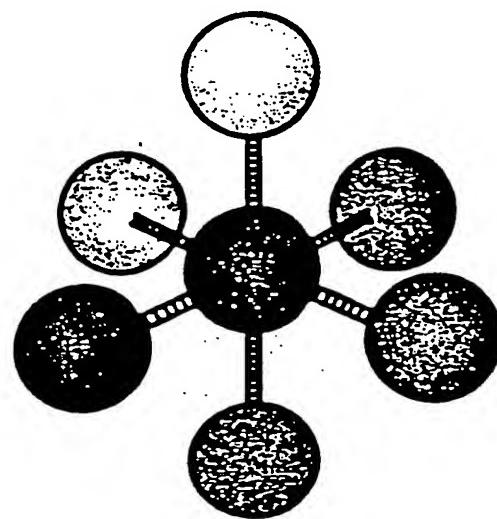
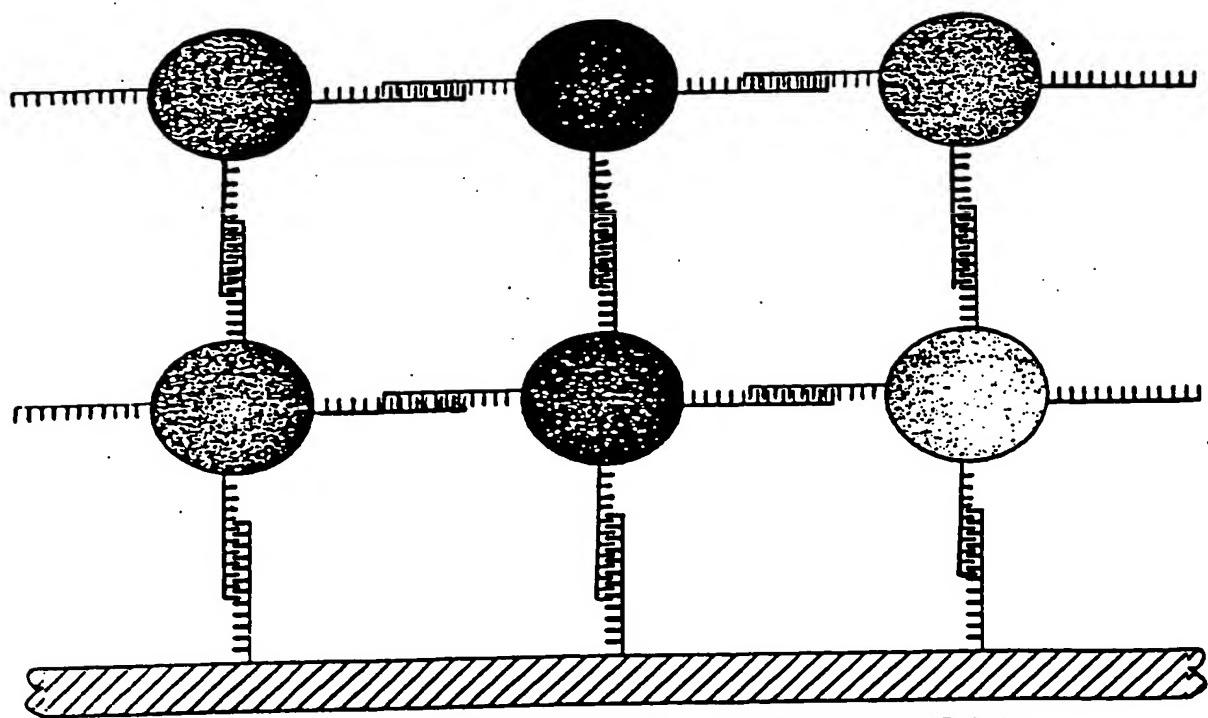


FIG. 35





Nanospheres arranged in Octahedron  
using 3D DNA nanoconstruction techniques

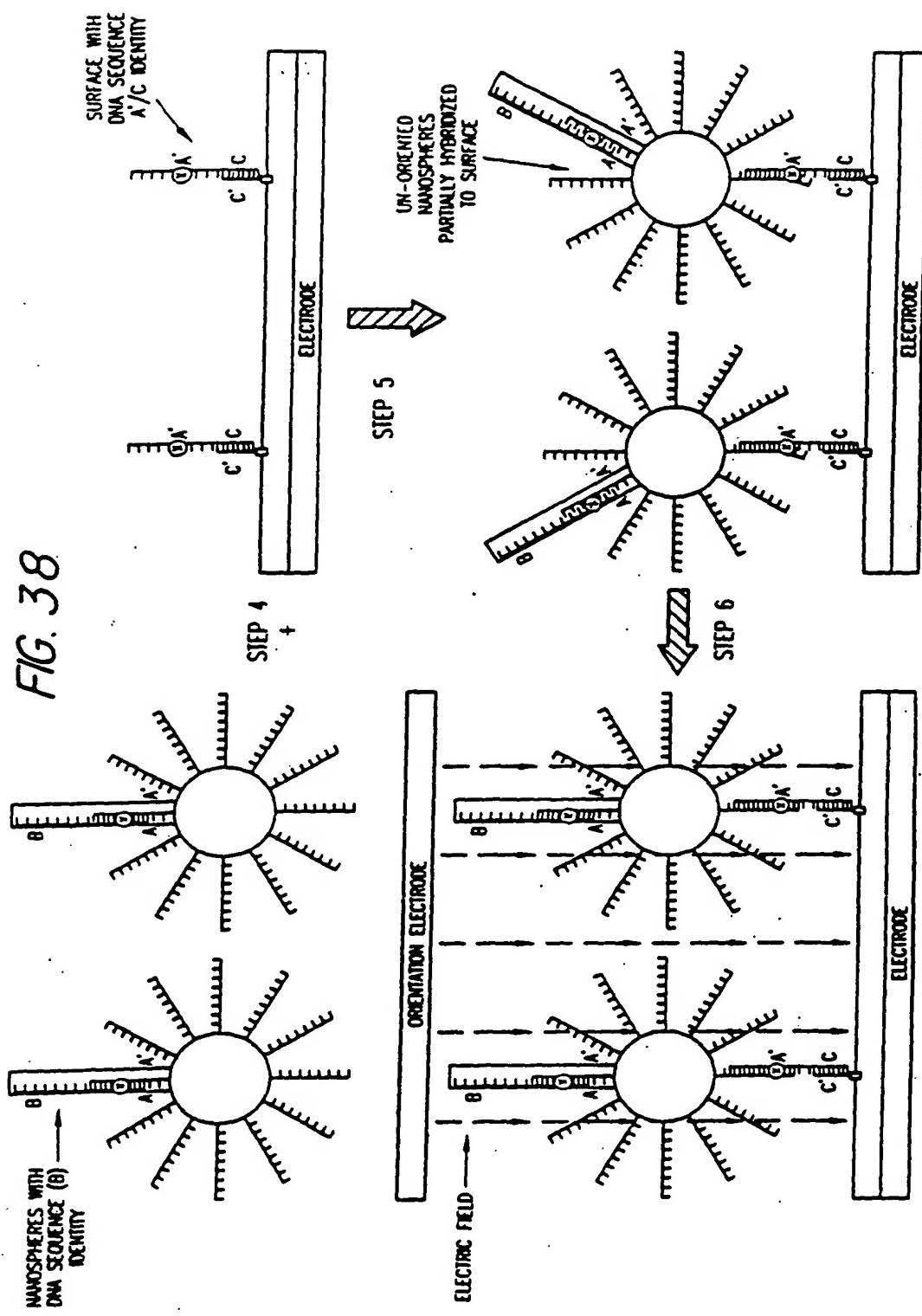


Nanospheres arranged into lattice structure and bound to surface to create a 3D device

FIG. 36

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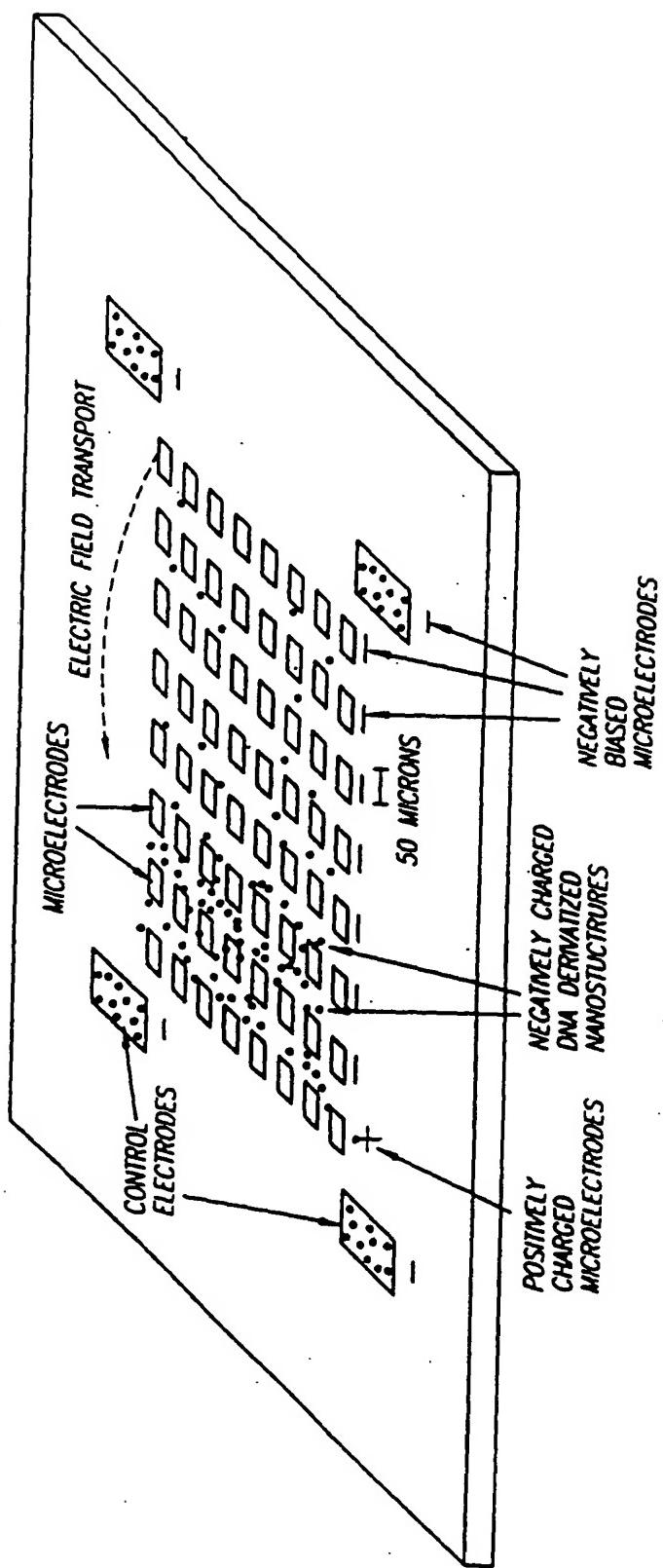


FIG. 39.

NEGATIVELY CHARGED TYPE 1 NANOSTRUCTURES  
MOVE TOWARD POSITIVELY BIASED MICROLOCATION

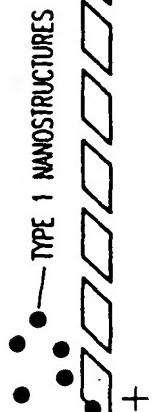


FIG. 40A

NEGATIVELY CHARGED TYPE 2 NANOSTRUCTURES ARE  
INTRODUCED OVER THE ARRAY AND ACCUMULATE  
ON THE POSITIVELY BIASED MICROLOCATIONS

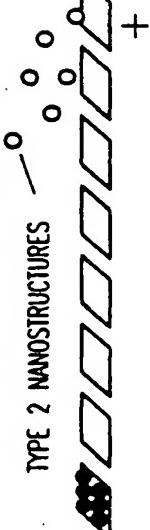


FIG. 40C

TYPE 1 NANOSTRUCTURES ACCUMULATE  
ON THE POSITIVELY BIASED MICROLOCATION  
BOTH TYPE 1 AND TYPE 2 NANOSTRUCTURES ARE NOW  
CLUSTERED ONTO THEIR RESPECTIVE MICROLOCATIONS



FIG. 40B

ELECTRONICALLY ASSISTED SELF-ASSEMBLY BEGINS WHEN  
MICROLOCATION #1 IS BIASED NEGATIVE AND A CENTER  
MICROLOCATION IS BIASED POSITIVE CAUSING THE NEGATIVELY  
CHARGED TYPE 1 NANOSTRUCTURES TO MOVE TO CENTER LOCATION

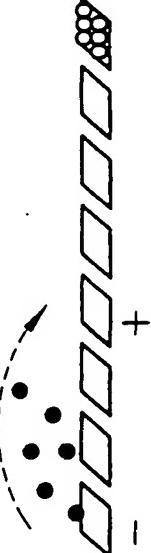
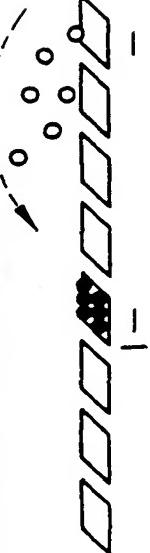


FIG. 40E

TYPE 2 NANOSTRUCTURES ARE MOVED TO CENTER  
LOCATION BY BIASING MICROLOCATION #8  
NEGATIVE AND CENTER LOCATION POSITIVE



TYPE 1 NANOSTRUCTURES ACCUMULATE AND  
HYBRIDIZE TO THE SPECIFIC MICROLOCATION  
TYPE 2 NANOSTRUCTURES CONTAINING COMPLEMENTARY  
DNA SEQUENCE HYBRIDIZE TO TYPE 1 NANOSTRUCTURES



FIG. 40H

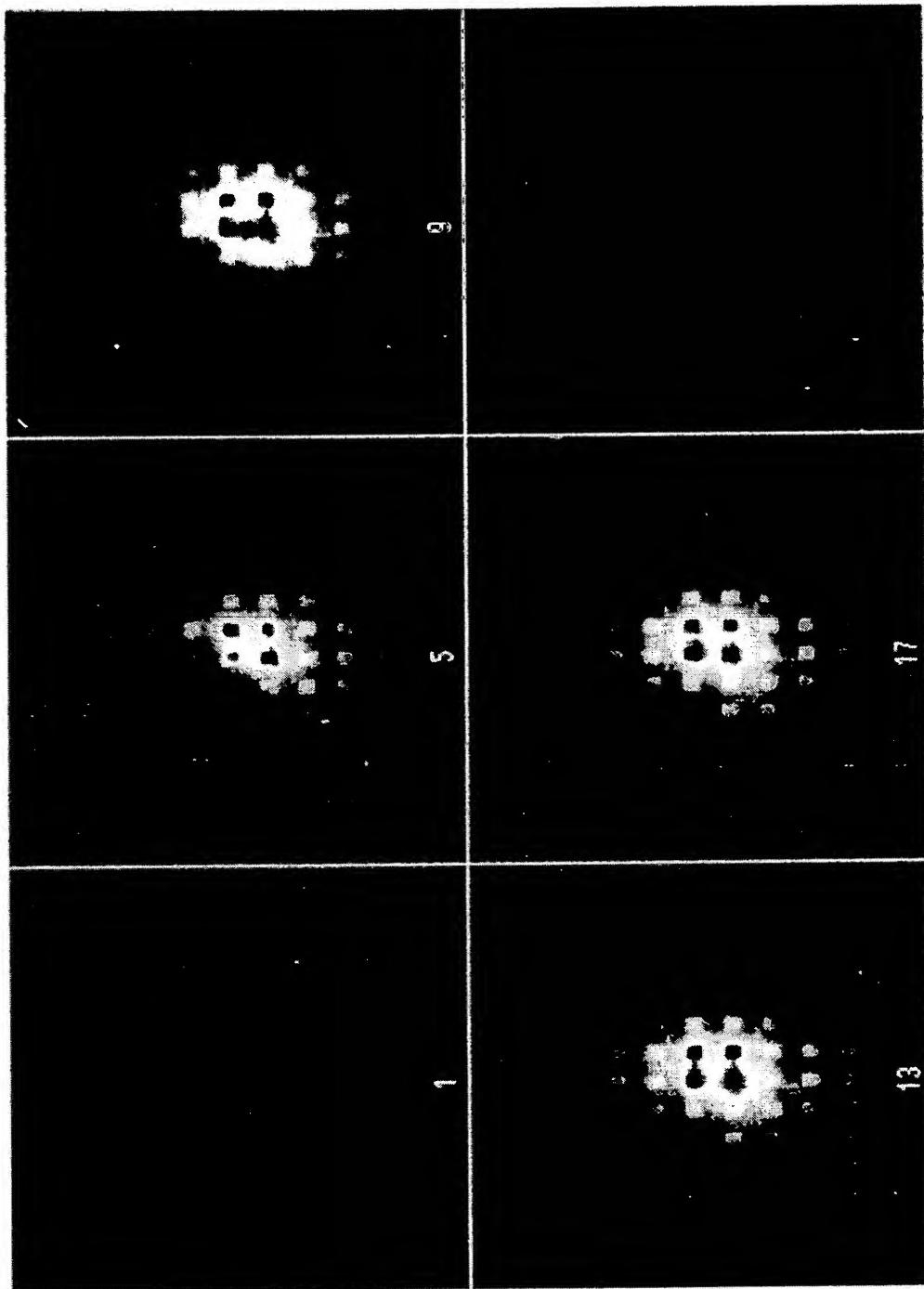
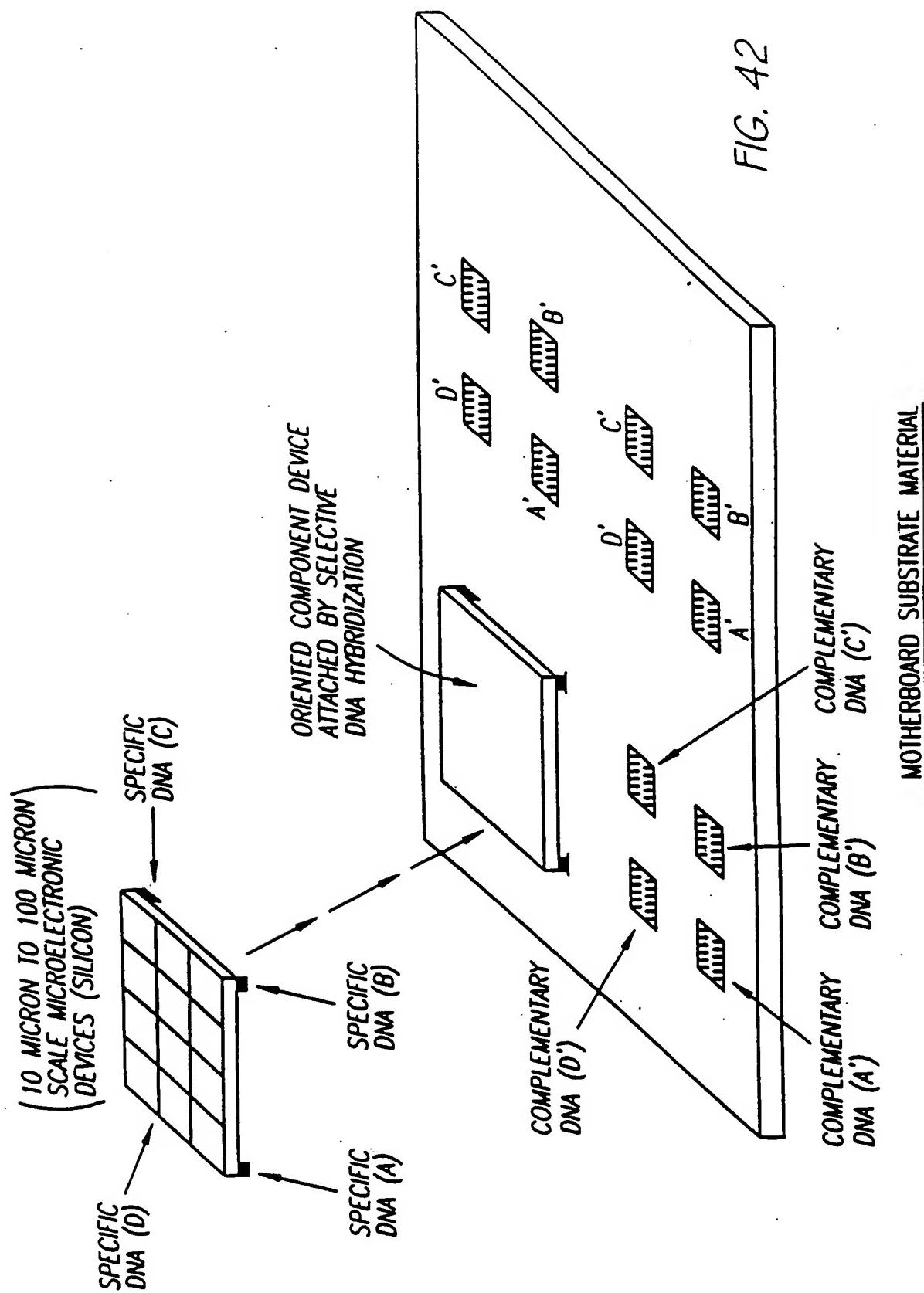


Fig. 41



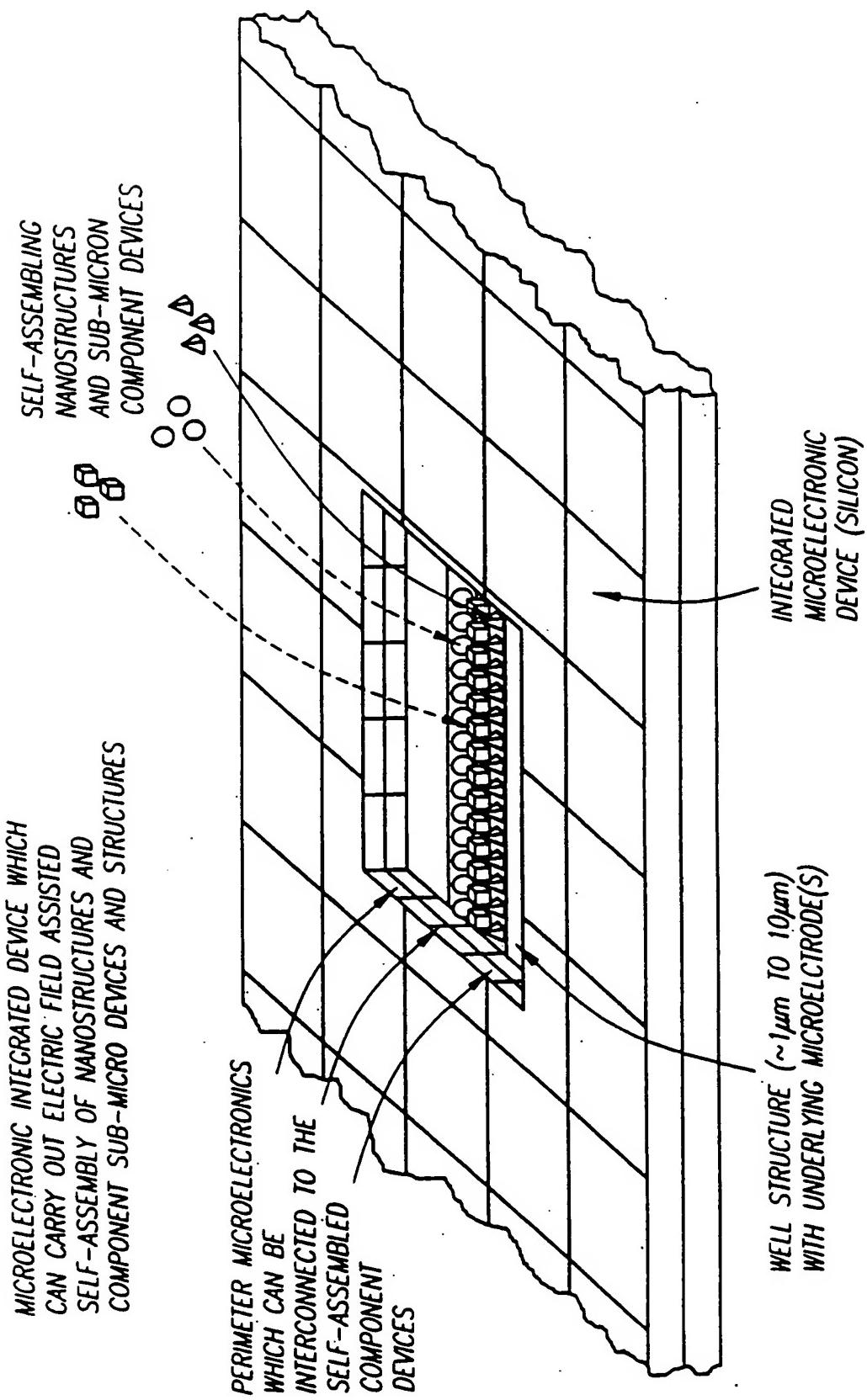


FIG. 43

SELF ASSEMBLY OF A DNA SELECTIVE MATRIX WITHIN  
PERIMETERS CREATED BY OTHER NANOFABRICATION TECHNIQUES

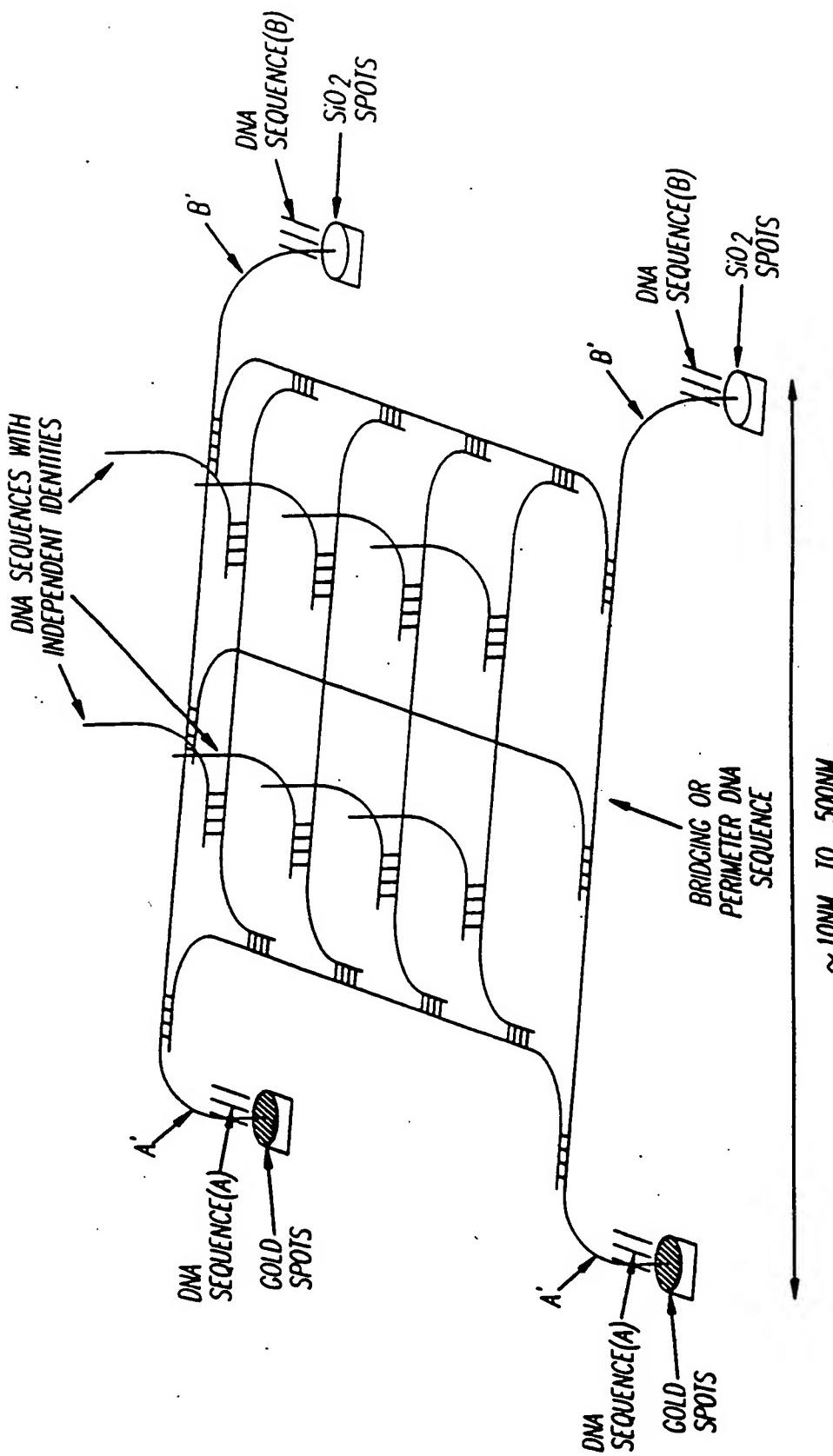
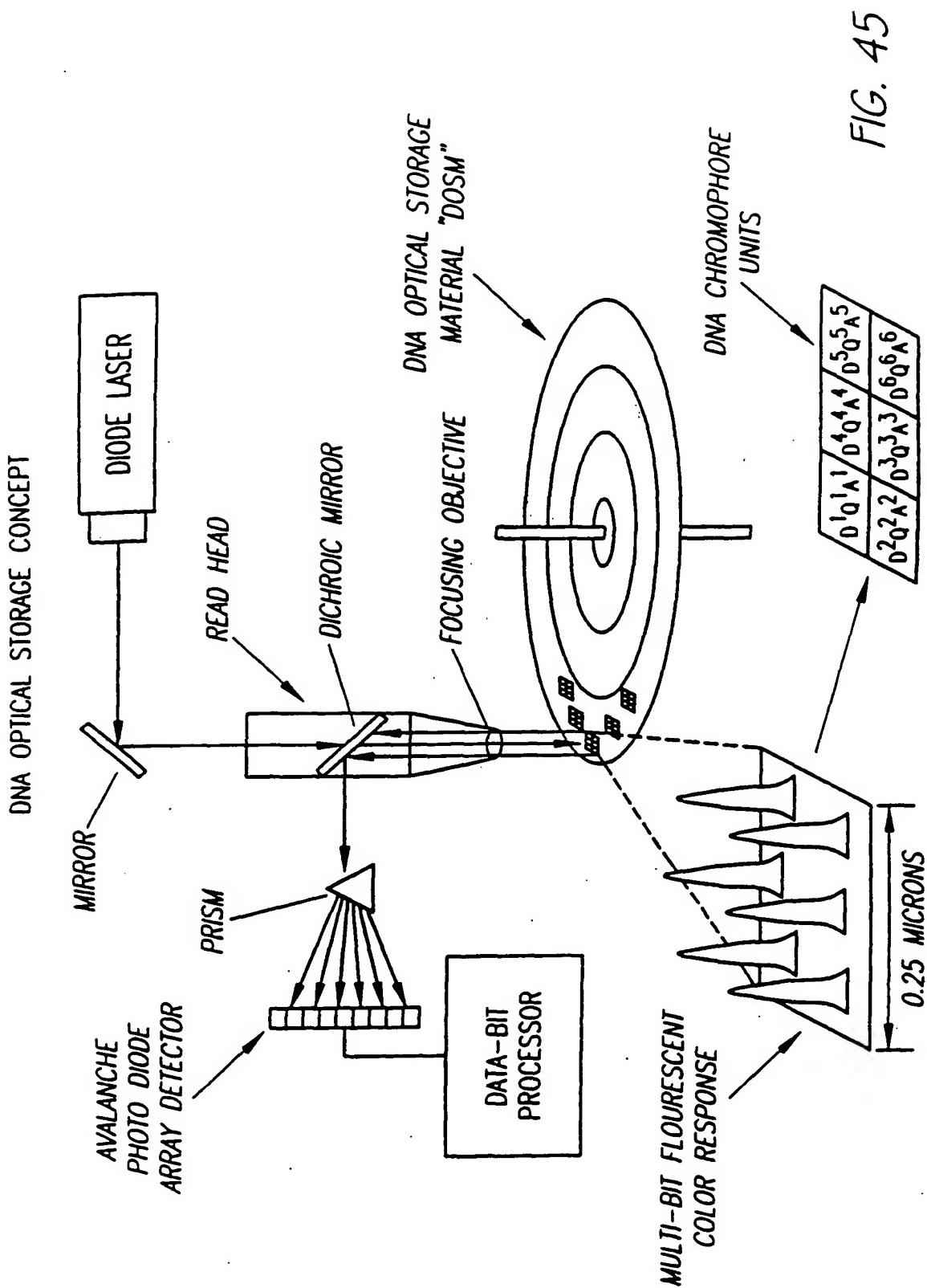


FIG. 44

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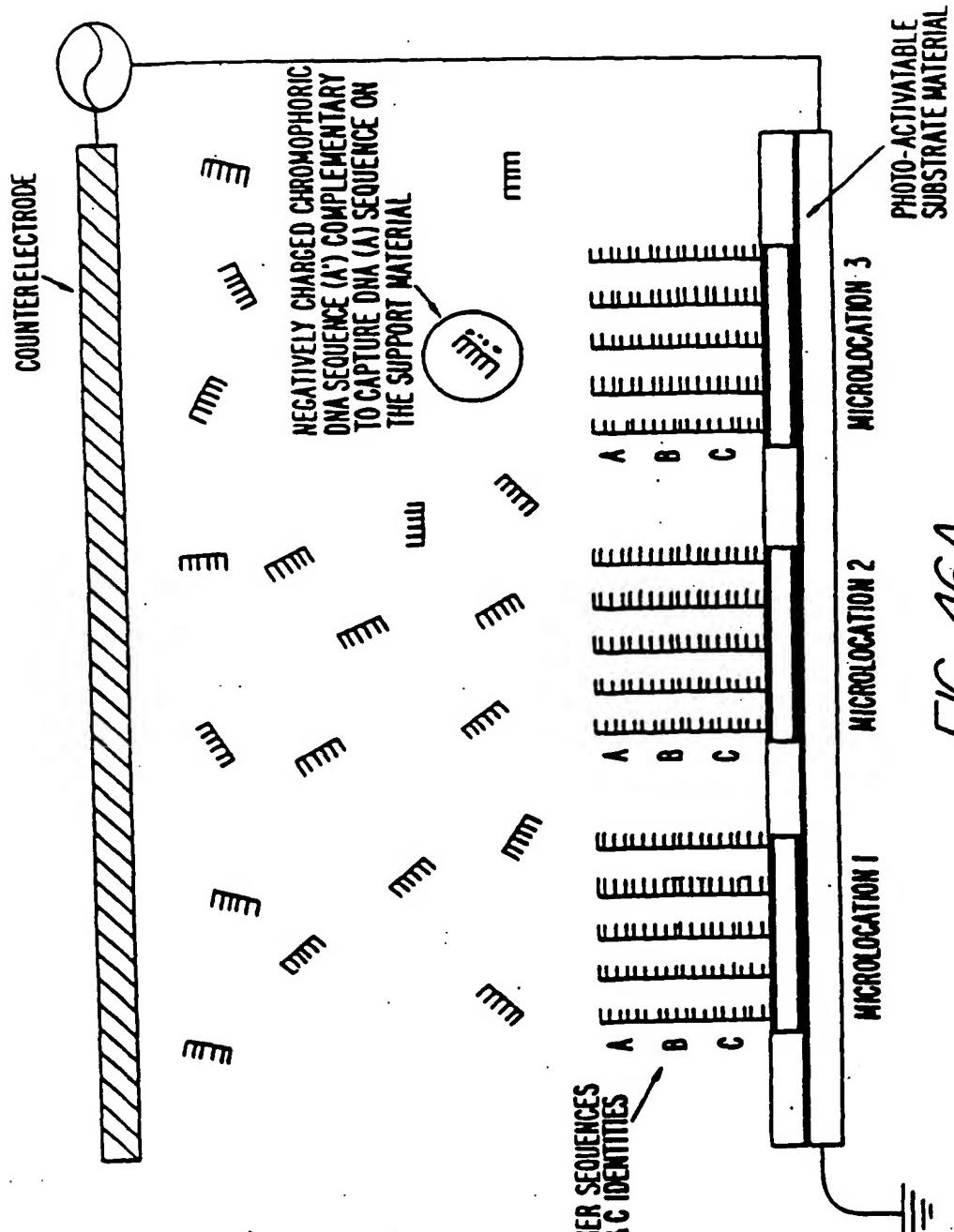


FIG. 46A

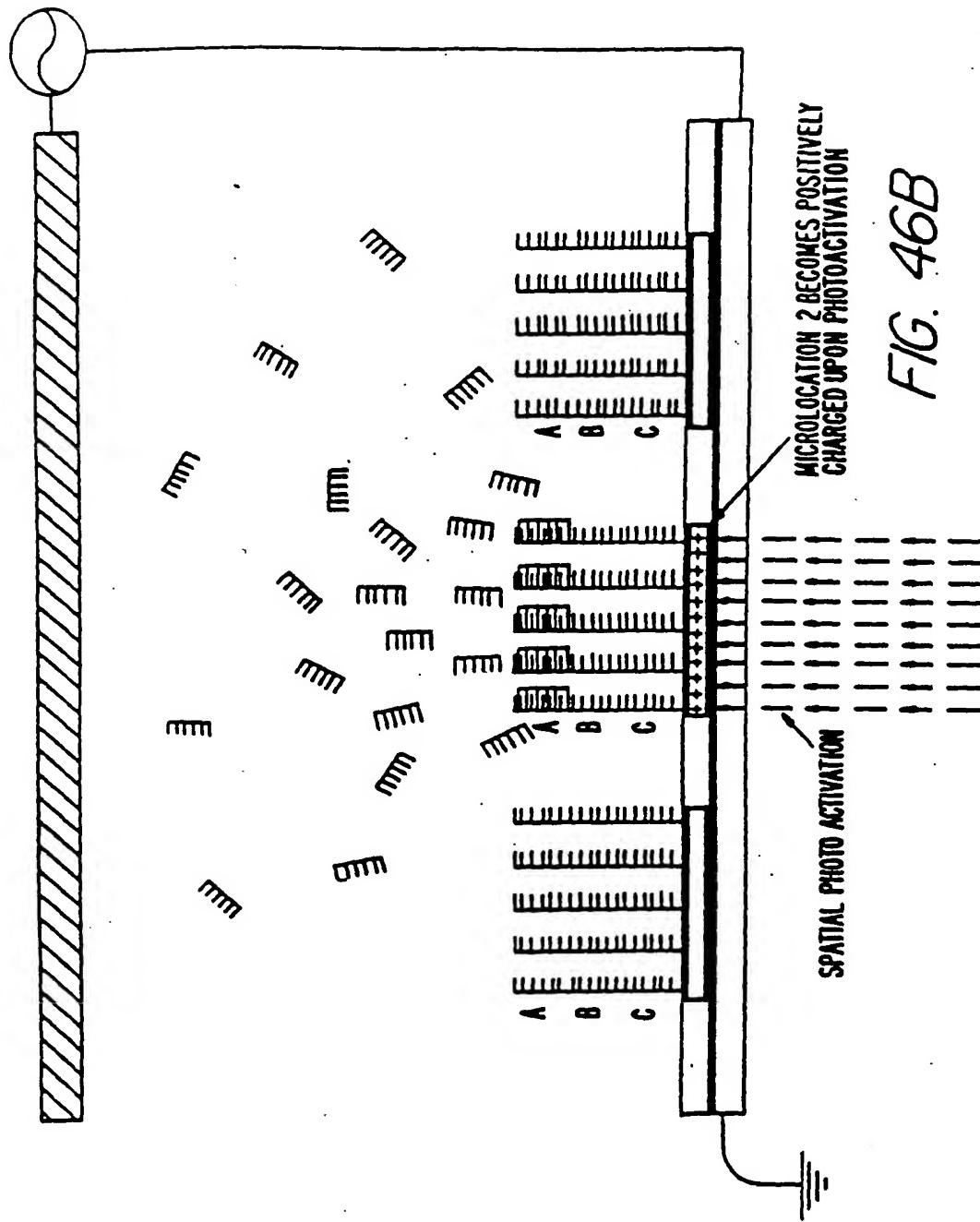


FIG. 46B

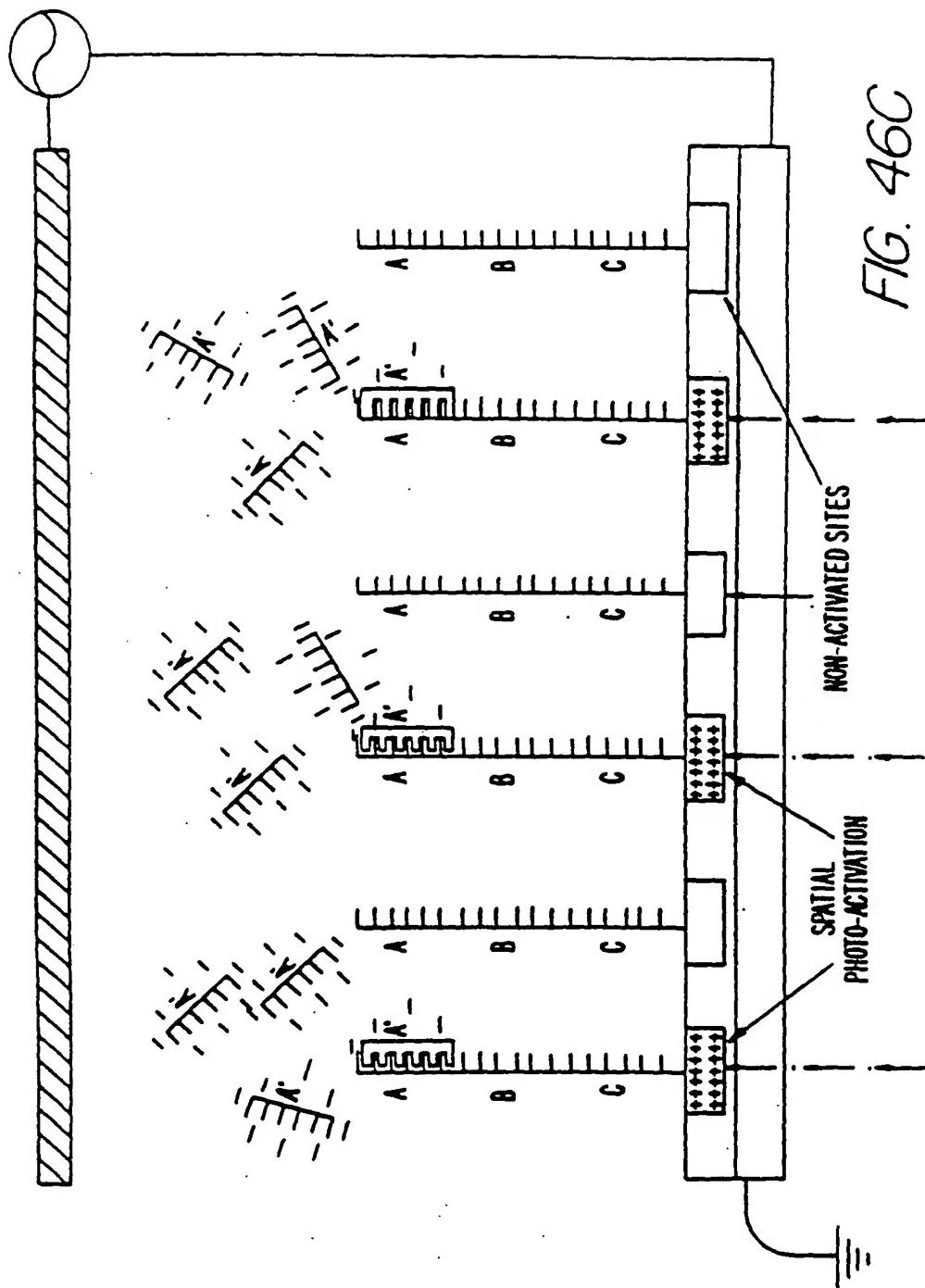


FIG. 46C

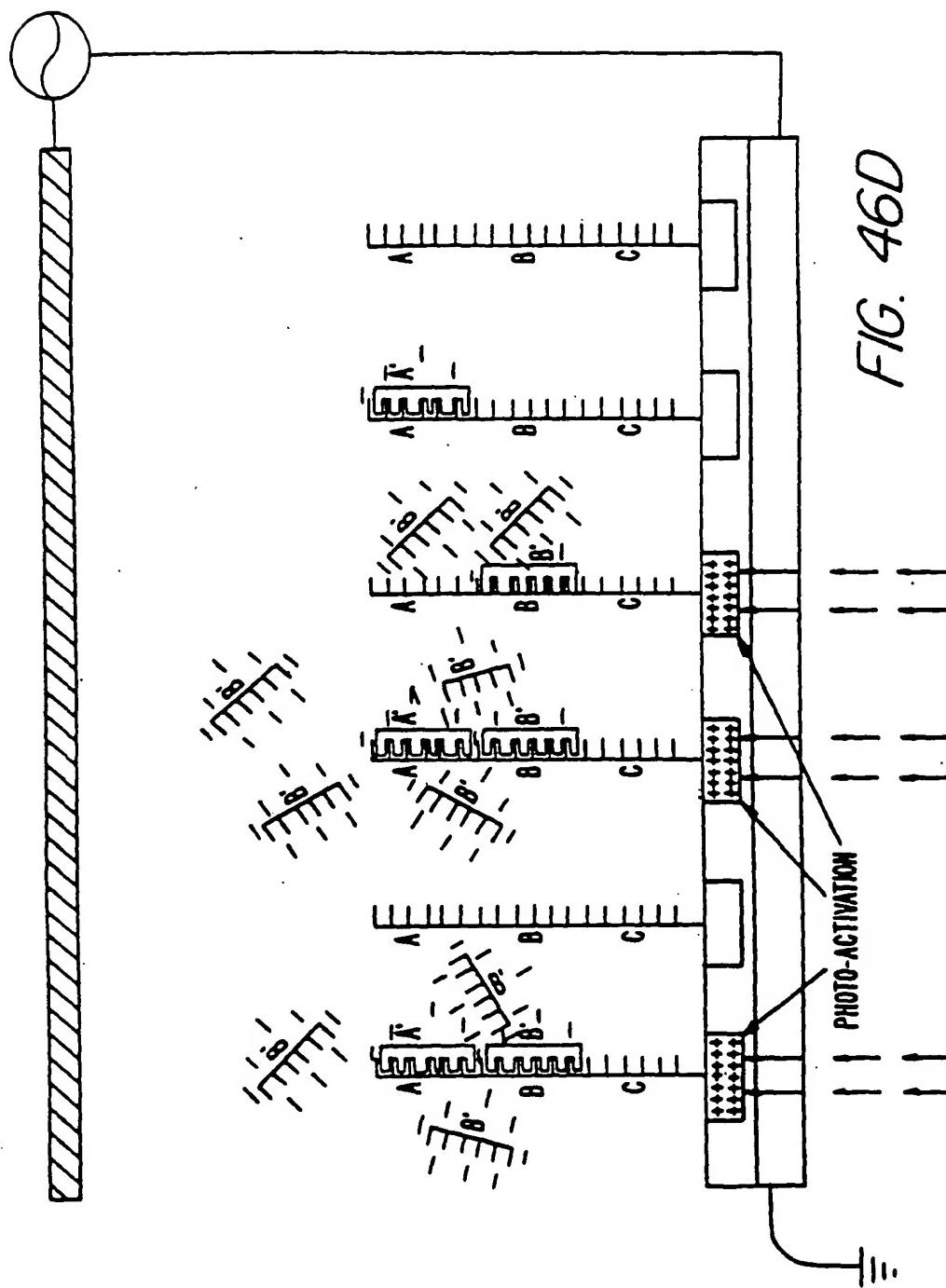


FIG. 46E

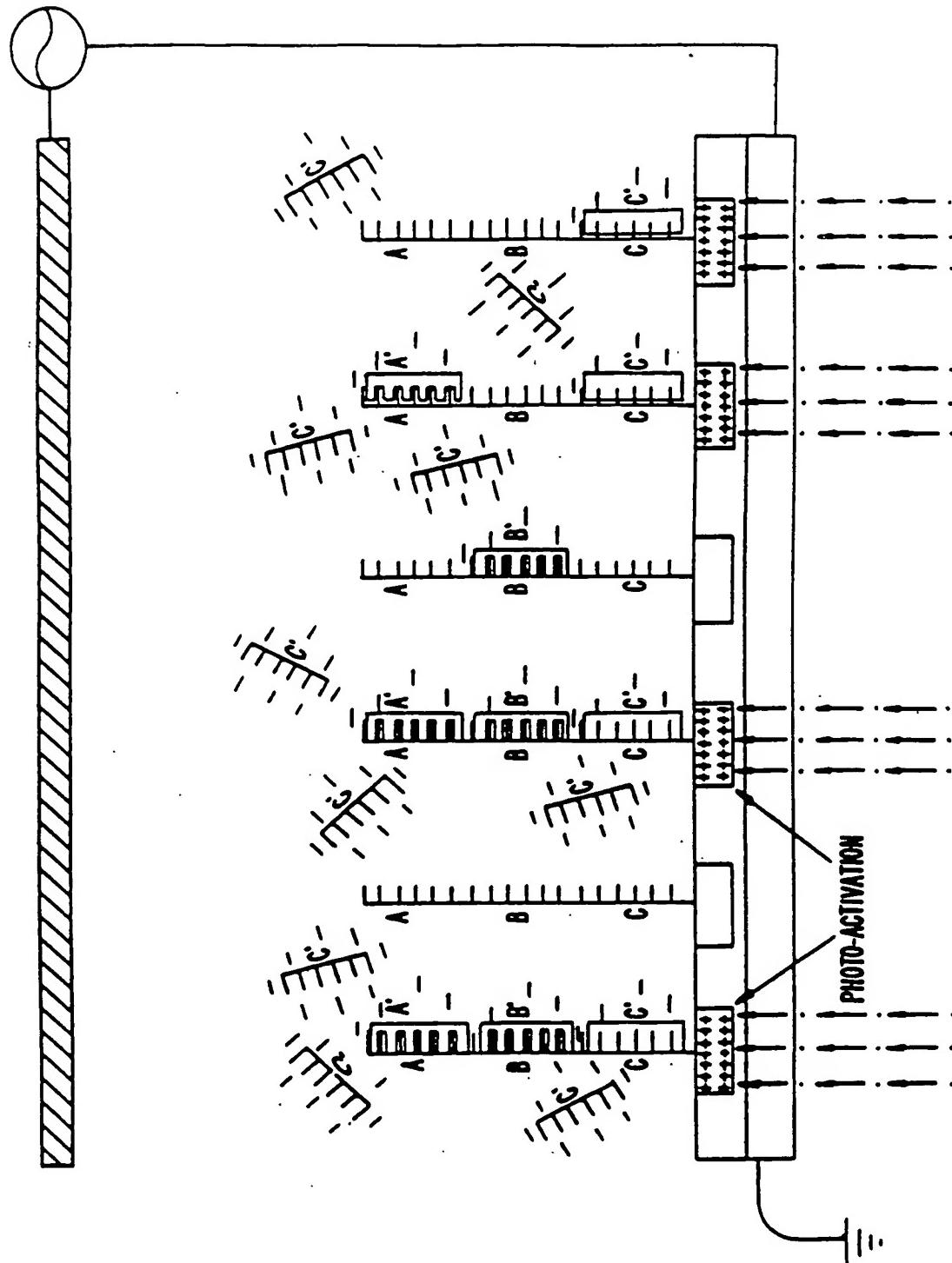


FIG. 46F  
SPATIAL LIGHT ADDRESSING PROCESS COMPLETE

